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MINISTRY OF CIVIL AVIATION

CERTIFICATE OF AIRWORTHINESS No. 1041
(Heavier than air.)

FULL NAME, ADDRESS AND NATIONALITY OF OWNER OR OF OWNING COMPANY.

1. Surname of owner (or name of Company): Percival Aircraft Ltd.
2. Christian name: -
3. Address: Luton Airport, Beds.
4. Nationality: British

NAME OF CONSTRUCTOR.

5. Percival Aircraft Ltd.

NATIONALITY AND REGISTRATION MARKS.

G-ALJA

6.

DESCRIPTION OF AIRCRAFT.

7. Prince Type P.50 Series 1 Constructor's No. P.5
8. Place and year of construction of aircraft: Luton, 1949.

Class of aircraft:
9. Land
10. Number of engines:
11. Number of
12. Maximum

Class:
13.
14. passengers.
(c) Public transport for mails.
(d) Private. (e) Aerial work.
(h) Demonstration. (i) Crew familiarisation.

15. Maximum span (in flying position): 56 feet 0 inches. Span (wings folded):
16. Maximum length (in flying position): 42 feet 10 inches.
17. Total height (with and without trolley in case of seaplane): 16 feet 1 inch.

Engines.
18. Number installed: Two.
19. Makes: Alvis.
20. Types: Leonides 501/4.
21. International power of the engine or engines at 8,750 feet

420/440 H.P. at 2,900 revolutions per minute and 3 lb/sq.in. indicated boost pressure
(International number of revolutions.)

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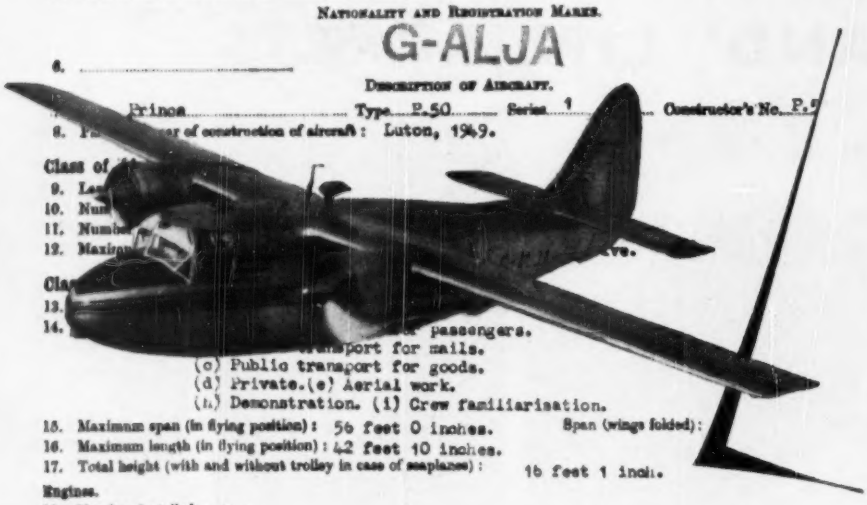

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BRETTENHAM HOUSE,
STRAND, LONDON, W.C.2.

5th December, 1949.

Percival Aircraft Limited,
Luton Airport,
Bedfordshire.

Dear Sirs,

Percival "Prince" P.50 Aircraft

The Board has completed the airworthiness investigation of the above-mentioned aircraft, using as a basis the British Civil Airworthiness Requirements in force when the original application for the issue of a Certificate of Airworthiness was received.

The Board has now recommended the issue of a British Certificate of Airworthiness in the "Normal" Category in the following sub-divisions:-

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(c) Public Transport for Goods
(d) Private
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(h) Demonstrations
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The current British Civil Airworthiness Requirements issued in 1948 incorporate the I.C.A.O. Transport Category "A" Airworthiness Standards, and from the survey which has been conducted the Board is satisfied that your aim to establish compliance with these later Requirements has, with minor exceptions, been achieved.

Yours faithfully,

Chief Executive,
Air Registration Board.

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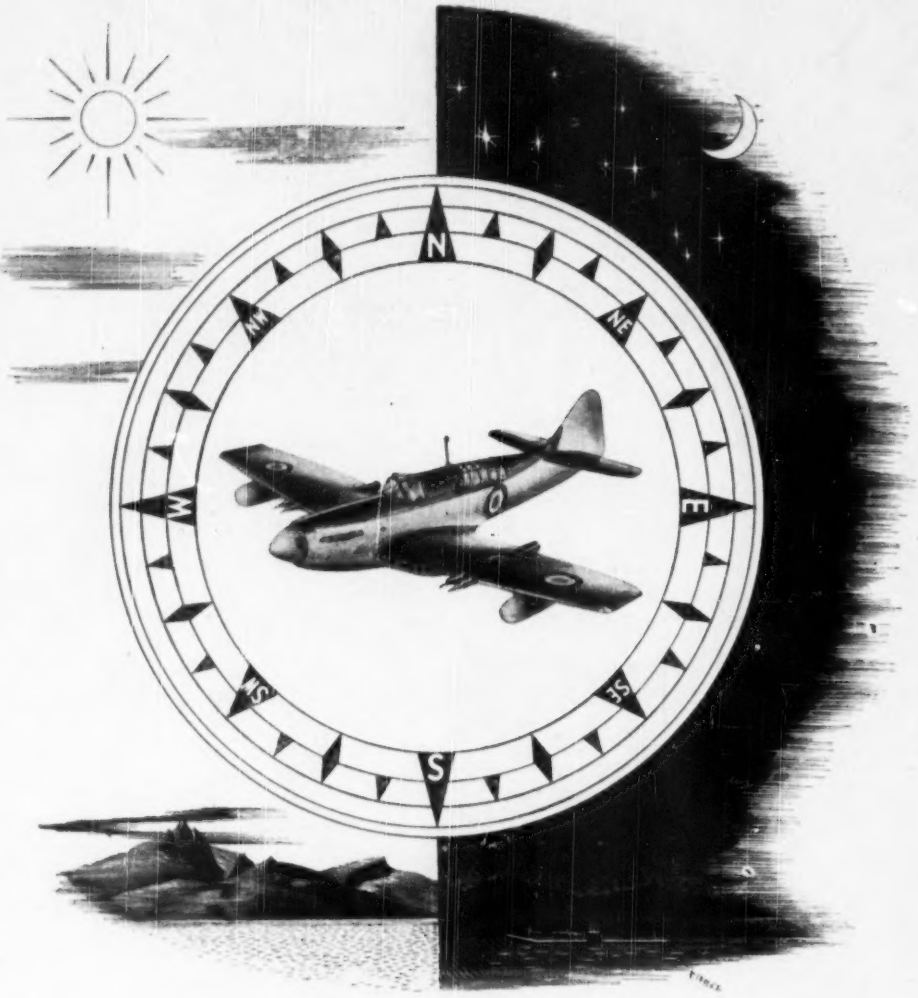

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Outdoing the Thrillers

SOME reflection on supersonic flying is appropriate on two accounts: the first—and the more sensational—an unconfirmed report that flight at a Mach number of 3 has been achieved by the Bell X-1; the second (more valuable in being carefully substantiated and detailed) an article by Stanley Evans in this issue, dealing with supersonic achievements of the Douglas Skyrocket.

Let it be remarked at the outset that the American Air Force and Navy, sponsors of the X-1 and Skyrocket respectively, have handled publicity for their supersonic achievements in an exasperatingly circumspect manner. Those "wild American claims" which are somehow instinctively believed by many people in this country to have been advanced (though this, on investigation, does not prove to be the case) have certainly not stemmed from official sources. So little authentic information has, in fact, seeped out of America that Mr. Evans' *Tonic Sonics* will come as a highly stimulating draught to many interested readers.

If, as an American aviation editor asserts, the Bell X-1 has achieved Mach 3, representing a speed of some 2,000 m.p.h., then the latest scientific thriller (see Gerald Kersh's *The Suppressed Part of the Sant Report* in the *Daily Mail* of December 30th) becomes as dated as the earlier romances of Wells. But whatever the truth behind the American editor's story, we may well speculate on how we might have reacted even two short years ago to the unequivocal report, now coldly and carefully set down in this very issue of *Flight*, that "supersonic flights have become more or less normal practice, even down to desert level."

That we in Britain have missed our first cue in the exciting drama of supersonic research is obvious to the world; but behind the scenes, we believe, resolute action is being taken to ensure that in the vital phase of developing aircraft for practical supersonic operation we shall not be found wanting in courage or resourcefulness.

Records

WHATEVER may be one's personal opinion on the value of records, there is ample evidence to indicate that the world public is impressed by fastest, highest, farthest and other superlative achievements, whether by animal or machine. Flying as a whole can seldom profit by such demonstrations if they are of the spectacular sort, but nearly always gains when they are of the workaday, routine service variety. Many aircraft records, both "ultimate" and class, are witness to both human and mechanical efficiency, and are of real technical value. Fighters need speed and climb, airliners carrying capacity.

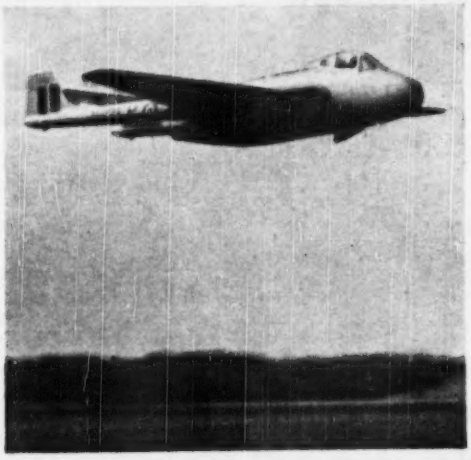
With each year that passes, the achievement of greater speed and higher altitude calls for more-specialized aircraft and increasingly taxes the ingenuity of the technician as much as the skill and courage of the pilot. Thus, to make such attempts becomes ever-more costly in cash and in the diversion of skilled men from more urgent work. This, more than anything else, accounts for the meagre showing which Britain makes in the list of world's records published in the following pages.

In the past, Service aircraft have been able to capture records almost as a routine job: for example, American bombers hold many for distance and speed with load. Probably for the last time, a standard jet fighter (the F-86) holds the world's speed record; there is certainly more than one research aircraft now capable of eclipsing its performance. It is a little disturbing that no British military aircraft in service to-day is capable of taking an ultimate or class record, although some prototypes—the S.R./A.1 and, no doubt, the Canberra, for example—are potential record-holders. It is significant that the Venom is very closely related to the Ghost-Vampire, Britain's successful contender for the altitude title. Surprisingly enough, no category exists for rate of climb; in this quality several British fighters excel.

Until this country is in a position further to enhance the prestige of her aircraft industry by regaining world records, there will be publicity value in continuing to demonstrate useful performance by high-speed capital-to-capital flights.

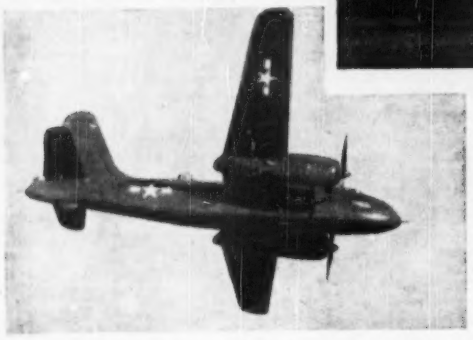
HIGHEST, FASTEST, FARTHEST

World's Air Records as They Stand To-day : United States and Russia Still Hold the Largest Share

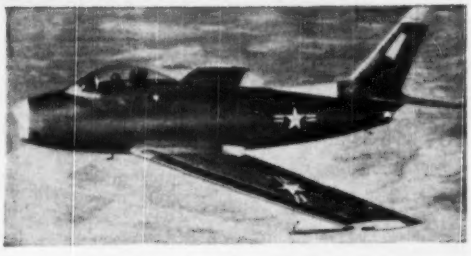


A Ghost-powered D.H. Vampire Mk.1 established the altitude record for powered aircraft.

Lockheed P2V-1—holder of the straight-line distance record since 1946.



The North American F-86 has earned the official title of the world's fastest aircraft.



IN reviewing international air records as homologated by the Fédération Aéronautique Internationale up to the end of 1949, it is once again regrettable that in the majority of classes the name of Great Britain seldom appears. The acknowledged excellence of British aircraft makes it anomalous that, out of some 80-odd unlimited and class records for powered aircraft only four are at present credited to this country; that no balloon or airship records are held is probably of no great consequence. That Britain has attempted so few international records in recent years is almost certainly due primarily to the great expense that such ventures involve, and to their inevitable interference with development programmes.

America and Russia remain the most prominent amongst the record-holders, having achieved their successes in most cases with standard or slightly modified military aircraft. The American B-29 still holds a large proportion of the weight-carrying records—a fact which prompts the thought that a British aircraft, the Canberra, would be capable of very considerably raising the speed figures in the class for aircraft carrying a load of up to 5,000 kg. That the lists as they stand are not a true reflection of technical progress is evidenced by the fact that many of the *hydravion* records are still held by pre-war Italian aircraft; had two of the three Saro A.1 flying boats not met with unfortunate accidents these particular figures might have looked very different by this time.

All helicopter records are at present held in the United States—by the Sikorsky R-5A and the newer S-52-1.

One or two events of the past two years present brighter spots in this rather gloomy picture. There was, for instance, the breaking of the world's heavier-than-air height record by John Cunningham with a Ghost-powered Vampire I, which achieved a height of 18,119 m (59,445ft) in March, 1948. In 1948, too, John Derry captured the "speed over 100 km" title for Britain with the extremely creditable figure of 974 km/hr (605.23 m.p.h.) in the D.H. 108. Maximum speed at low level, however, still stands to the credit of the United States with Major Richard Johnson's flight in the North American F-86 at 1,080 km/hr (670.981 m.p.h.).

During 1949 the only successful record attempts of any significance were the 7,978 km (4,957 miles) flight by William C. Odom in the Beech Bonanza from Honolulu to Teterboro, New Jersey, which captured for America the light-aircraft distance-in-a-straight-line record in two categories; Madame du Peyron's flight of 5,932 km (3,686 miles) in the Morane-Saulnier monoplane from Mont-de-Marsan to Jiwani in Baluchistan, an exceptional performance for an aircraft with an engine in the 4-6.5 cubic litre capacity category; the breaking of the absolute height record for gliders by J. Robinson of the United States, who achieved an altitude of 10,211 m (33,497ft); and a flight by Guy Marchand in the Nord 2000, which gained for France the duration record for single-seat sailplanes with a flight of 40 hr 51 min. Another notable achievement was that of Réné Leduc, who ascended to

"ABSOLUTE" RECORDS

Straight-line distance (United States).—Cdrs. Davies, Rankin, Reid and Tabeling, U.S.N. (Lockheed P2V-1). Perth, Australia, to Columbus, Ohio, Sept. 29th-Oct. 1st, 1946. 18,081.990 km (11,237 miles).

Altitude (United States).—Capt. O. A. Anderson and Capt. Albert W. Stevens (4,000 cu m balloon), Nov. 11th, 1935. 22,066 m (72,395ft).

Speed at Low Level (United States).—Maj. R. L. Johnson, U.S.A.F. (North American F-86), Sept. 15th, 1948. 1,079.841 km/hr (670.981 m.p.h.).

7,788 m (25,551ft) with an aircraft of his own design powered by a Zündapp engine of less than two litres capacity.

In the place-to-place-record category, Britain's position is far more favourable: of the 32 officially recognized flights listed by the F.A.I., this country holds 15. In 1949 S/L. Neville Duke, with a Hawker Fury, established London-Rome and London-Karachi records; four Sea Furies, led by Lt/Cdr. McWhirter, flew from London to Valetta at 624.6 km/hr (387.18 m.p.h.); and a Hornet 3 flown by G/C. Carver gave Britain the honour of the London-Gibraltar record at an average speed of 701.5 km/hr (435.87 m.p.h.).

A selection of the principal records to date, taken from the lists published by the F.A.I., is printed below, with recent amendments as approved and confirmed by the Royal Aero Club.

British national records appear on page 6.

INTERNATIONAL CLASS RECORDS

CLASS A (Balloons)

(8th CATEGORY OVER 4,001 CU. M)

Altitude (U.S.A.)
Capts. O. A. Anderson and A. W. Stevens. Nov. 11th, 1935. 22,066 m

CLASS B (Airships)

Distance in a straight line (Germany)
Dr. Eckener.
LZ-127 (*Graf Zeppelin*) from Lakehurst, U.S.A., to Friedrichshafen.
Nov. 1st, 1928. 6,384.5 km.

CLASS C (Powered Aircraft)

LANDPLANES

Closed circuit distance (U.S.A.)
Lt. Col. Lassiter and Capt. Valentine.
Boeing B-29. Aug. 3rd-5th, 1947. 14,349.656 km (8,854.5 miles).

Distance in a straight line (U.S.A.)
Cdrs. Davies, Rankin, Reid and Lt. Cdr. Tabeling (U.S.N.).
Lockheed P2V-1. Oct. 1st, 1946. 18,081.900 km (11,237 miles).

Altitude (G.B.)
G/C. J. Cunningham.
D.H. Vampire I (powered by Ghost turbojet).
March 23rd, 1948. 18,119 m (59,445ft).

Maximum speed at low level (U.S.A.)
Major R. L. Johnson, U.S.A.F.
North American F-86. Sept. 15th, 1948. 1,079.841 km/hr. (670.981 m.p.h.).

Speed over 100 km (G.B.)
J. Derry. April 12th, 1948.
D.H. 108. 974.0259 km/hr

Speed over 1,000 km (U.S.A.)
Lt. H. A. Johnson, U.S.A.F.
June 3rd, 1947. Lockheed F-80. 745.079 km/hr

Speed over 2,000 km (U.S.A.)
Miss Jacqueline Cochrane. May 22nd, 1948. North American F-51. 720.134 km/hr

Speed over 5,000 km (U.S.A.)
Capt. J. Bauer and crew. June 28th, 1946.
Boeing B-29. 544.490 km/hr

Speed over 10,000 km (U.S.A.)
Lt. Col. O. F. Lassiter and crew. June 29th, 1947.
Boeing B-29. 439.665 km/hr

Records with Loads

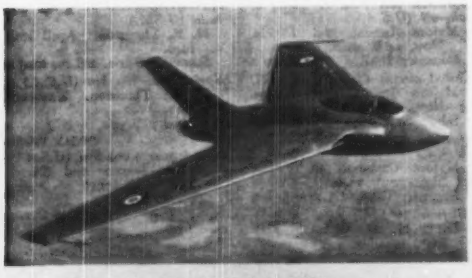
Carrying 1,000 kg

Altitude (U.S.A.)
Major F. F. Ross and crew. May 16th, 1946.
Boeing B-29. 14,603 m

Speed over 1,000 km (U.S.A.)
Lt. Col. Geretty and crew. June 20th, 1946.
Douglas XA-26F. 660.526 km/hr

Speed over 2,000 km (U.S.A.)
Lt. E. M. Grabowski. May 17th, 1946.
Boeing B-29. 588.456 km/hr

Speed over 5,000 km (U.S.A.)
Capt. J. Bauer and crew. June 28th, 1946.
Boeing B-29. 544.490 km/hr



The D.H. 108, holder of the 100 km record.

The Boeing B29 is the holder of many "with load" records.

2,000 kg

Altitude (U.S.A.)
Col. E. D. Reynolds and crew. May 13th, 1946.
Boeing B-29. 14,180 m

Speed over 1,000 km (U.S.A.)
Lt. E. M. Grabowski and crew. May 17th, 1946.
Boeing B-29. 594.963 km/hr

Speed over 2,000 km (U.S.A.)
Lt. E. M. Grabowski and crew. May 17th, 1946.
Boeing B-29. 588.456 km/hr

Speed over 5,000 km (U.S.A.)
Capt. J. Bauer and crew. June 28th, 1946.
Boeing B-29. 544.490 km/hr

5,000 kg

Altitude (U.S.A.)
Lt. J. B. Tobison and crew. May 14th, 1946.
Boeing B-29. 13,793 m

Speed over 1,000 km (U.S.A.)
Lt. E. M. Grabowski and crew. May 17th, 1946.
Boeing B-29. 594.963 km/hr

Speed over 2,000 km (U.S.A.)
Lt. E. M. Grabowski and crew. May 17th, 1946.
Boeing B-29. 588.456 km/hr

Speed over 5,000 km (U.S.A.)
Lt. Col. Ruegg and crew. June 21st, 1946.
Boeing B-29. 428.123 km/hr

10,000 kg

Altitude (U.S.A.)
Capt. A. A. Pearson and crew. May 8th, 1946.
Boeing B-29. 12,668 m

Speed over 1,000 km (U.S.A.)
Capt. J. D. Bartlett and crew. May 19th, 1946.
Boeing B-29. 574.953 km/hr

Speed over 5,000 km (U.S.A.)
Lt. Col. Ruegg and crew. June 21st, 1946.
Boeing B-29. 428.123 km/hr

15,000 kg

Altitude (U.S.A.)
Col. J. B. Waren and crew. May 11th, 1946.
Boeing B-29. 12,046 m

Greatest load carried to height of 2,000 m
Col. J. B. Waren and crew. May 11th, 1946.
Boeing B-29. 15,166 kg

LIGHT AIRCRAFT

Classified according to a.u.w.

Category 1 (Less than 500 kg)

Altitude (France)
R. Leduc. June 13th, 1949.
Leduc Monoplane. Weight 345.060 km.
Altitude: 7,788 m

Distance in a straight line (France)
M. E. Cassin. July 28th, 1949.
Leopoldof. 892.371 km

Category 2. (500-1,000 kg)

Speed over 100 km (U.S.S.R.)
Mlle. A. Bodriaguina. Sept. 16th.
YAK-18. 262.771 km/hr

Speed over 1,000 km (U.S.S.R.)
Y. Forostenco. Sept. 6th.
YAK-18. 223.560 km/hr

Altitude (France)
Mlle. E. Boselli. May 21st, 1949.
Piper Cub. 5,791 m

(*Continued overleaf*)

HIGHEST, FASTEST, FARTHEST . . .

Category 3 (1,000-1,750 kg)

Distance in a straight line (U.S.A.)
W. P. Odom. March 7th-8th, 1949.
Beechcraft Bonanza.
7,977.920 km

Classified according to engine capacity

Category 1 (Cubic capacity 6.5-9 litres)

Distance in a straight line (U.S.A.)
W. P. Odom. March 7th-8th, 1949.
Beechcraft Bonanza.
7,977.920 km

Altitude (Germany)
H. Illig. July 7th, 1939.
Messerschmitt BF108. 9,075 m

Speed over 100 km (Italy)
G. Parodi. Aug. 27th, 1939.
S.A.I. Ambrosini-7.
392.584 km/hr

Category 2 (Cubic capacity 4-6.5 litres)

Distance in a straight line (France)
Mme. du Peyron. May 8th, 1949.
Morane-Saulnier 571.
5,632 km

Altitude (Germany)
H. Kalkstein. Oct. 13th, 1938.
Klemm KL-35D. 8,303 m

Speed over 100 km (U.S.A.)
S. J. Wittman. Sept. 19th, 1937.
Wittman Special.
383.386 km/hr

Speed over 1,000 km (France)
N. Arnoux. Oct. 23rd, 1938.
Caudron 660. 319.534 km/hr

Speed over 2,000 km (France)
N. Arnoux. Oct. 23rd, 1938.
Caudron 660. 317.779 km/hr

Category 3 (Cubic capacity 2-4 litres)

Distance in a straight line (Germany)
O. H. Bulkowsky and R. Jenett. Dec. 29th-31st, 1938.
Arado Ar-79. 6,303.840 km

Altitude (Germany)
Dr. F. Platz. July 5th, 1930.
Gotha Go 150. 8,048 m

Speed over 100 km (France)
J. J. Lallemant. May 6th, 1939.
Maubossin 200.
274.232 km/hr

Speed over 1,000 km (France)
J. J. Lallemant. May 7th, 1939.
Maubossin 200.
255.358 km/hr

Speed over 2,000 km (Germany)
F. Seelbach. July 29th, 1938.
Arado Ar-79. 227.029 km/hr

Category 4 (Cubic capacity up to 2 litres)

Distance in a straight line (France)
Alle. J. Foujade. Sept. 13th, 1948.
Stark AS-71. 2,028.388 km.

Altitude (France)
R. Leduc. June 13th, 1949.
Leduc monoplane. 7,257 m

Speed over 100 km (G.B.)
S/L. R. Perteous. July 31st, 1947.
Chilton monoplane.
190.115 km/hr

Speed over 1,000 km (Germany)
M. Brandenburg. April 29th, 1939.
Stomo-3.
187.746 km/hr

SEAPLANES and FLYING BOATS

Closed circuit distance (Italy)
M. Stoppani and C. Tonini. May 27th-28th, 1937.
Cant Z-506. 5,200 km

Distance in a straight line (G.B.)
Capt. D. C. T. Bennett and crew. Oct. 6th-8th, 1938.
Short-Mayo "Mercury."
9,652.001 km

Altitude (Italy)
Lt. Col. N. di Manco. Sept. 23th, 1939.
Caproni 161 bis. 13,342 m

Maximum speed at low level (Italy)
Francesco Agello. Oct. 23rd, 1934.
Macchi C.72. 709.209 km/hr

Speed over 100 km (Italy)
G. Cassinelli. Oct. 8th, 1933.
Macchi C.72. 629.370 km/hr

Speed over 1,000 km (Italy)
M. Stoppani and G. Gorini. March 30th, 1938.
Cant Z.509. 403.424 km/hr

Speed over 2,000 km (Italy)
M. Stoppani and G. Gorini. March 30th, 1938.
Cant Z.506. 399.64 km/hr

Speed over 5,000 km (Italy)
M. Stoppani and C. Tonini. May 27th-28th, 1937.
Cant Z.506. 368.424 km/hr

(Records with load for light aircraft in this class are omitted.)

AMPHIBIANS

Distance in a straight line (U.S.A.)
Brig. Gen. F. M. Andrews. June 29th, 1936.
Douglas Y.O.A-5. 2,300.800 km

Altitude (U.S.A.)
Capt. B. Sergievsky. April 14th, 1946.
Sikorsky S-43. 7,805 m

Speed over 100 km (U.S.A.)
Major A. P. de Seversky. December 19th, 1936.
Seversky Amphibian.
337.079 km/hr

Speed over 1,000 km (U.S.A.)
Capts. Sloane and Boatner. July 31st, 1939.
Grumman OA-9.
299.461 km/hr

The Chilton with Train 4.T. engine—smallest 100 km. closed-circuit record holder.

Maximum speed at low level (U.S.A.)
Major A. P. de Seversky. Sept. 15th, 1935.
Seversky Amphibian.
370.814 km/hr

Speed over 2,000 km (Italy)
G. Barei and E. Rossaldi. May 6th, 1937.
Macchi C.94. 248.967 km/hr

Carrying 1,000 kg

Altitude (U.S.S.R.)
I. Soukhomline. June 17th, 1940.
Amphibian Tsagii 44-D.
7,134 m

(This crew also holds the record for 2,000 kg, 5,000 kg, altitude and speed over 1,000 km.)

CLASS D (Gliders)

Category 1 (Single seaters)

Duration (France)
G. Marchand. March 16th-18th, 1949.
Nord-2000 sailplane.
40 hr 51 min

Distance in a straight line (U.S.S.R.)
Mlle. O. Kepikova. July 6th, 1939.
Rot Front 7. 749.203 km

Absolute altitude (U.S.A.)
J. Robinson. July 1st, 1949.
Ross Stephens 1.
10,210.821 m

Speed over 100 km triangular course (Switzerland)
S. Maurer. July 22nd, 1948.
Moswey-III. 69.6 km/hr

Goal flight with return to point of take-off (U.S.A.)
P. B. MacCready, Jnr. July 16th, 1947.
Sailplane NX-14287.
368.844 km

Goal flight (U.S.S.R.)
P. Savtzov. July 31st, 1939.
Rot Front 7. 602.358 km

Height above take-off point (Sweden)
Lt. P. A. Persson. July 12th, 1947.
Weihe sailplane. 8,050 m

Category 2 (Multi-seaters)

Duration returning to take-off point (Germany)
A. Bödecker and K. H. Zander. Dec. 9th-11th, 1938.
Kranich sailplane.
50 hr 26 min

Distance in a straight line (U.S.S.R.)
I. Kartarchev. July 17th, 1938.
Stakhanovetz glider.
619.745 km

Distance returning to take-off point (U.S.S.R.)
I. Kartarchev. June 17th, 1940.
Stakhanovetz glider.
416.070 km

Goal flight (U.S.S.R.)
I. Kartarchev. June 19th, 1940.
Stakhanovetz glider.
495.020 km

Height gained (France)
G. Rousselet and L. Faivre. Sept. 21st, 1948.
Kranich. 6,780 m

CLASS C (Helicopters)

Duration returning to point of take-off (U.S.A.)
Majors Jensen and Dodds. Nov. 14th, 1946.
Sikorsky R-5A. 9 hr 57 min

Closed circuit distance (U.S.A.)
Majors Jensen and Dodds. Nov. 14th, 1946.
Sikorsky R-5A. 1,000 km

Distance in a straight line (U.S.A.)
Majors Cushman and Zins. May 22nd, 1946.
Sikorsky R-5A. 1,132.337 km

Altitude (U.S.A.)
Capt. H. D. Gaddis. May 21st, 1949.
Sikorsky S-52-1. 6,468 m

Maximum speed at 3 km altitude (U.S.A.)
H. E. Thomson. April 28th, 1949.
Sikorsky S-51-1. 208.494 km/hr

Speed over 100 km (U.S.A.)
H. E. Thomson. May 6th, 1949.
Sikorsky S-52-1.
197.545 km/hr

Speed over 1,000 km (U.S.A.)
Majors Jensen and Dodds. Nov. 14th, 1946.
Sikorsky R5-A.
107.251 km/hr

(Continued overleaf)

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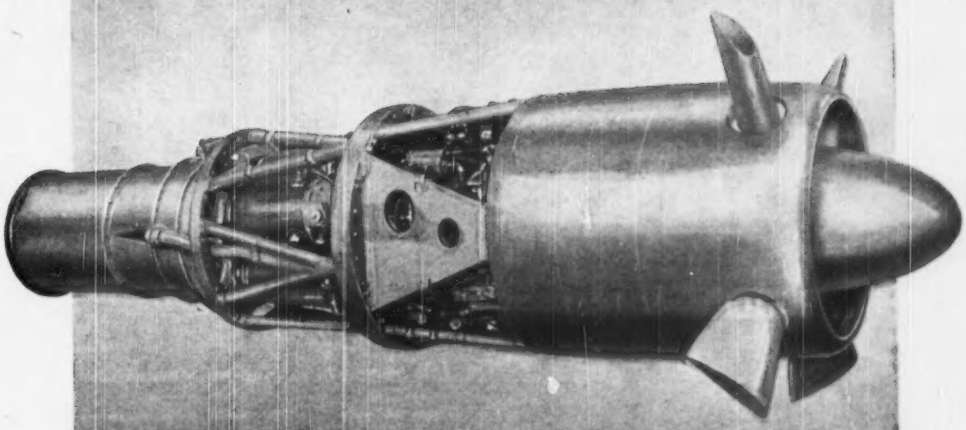
WEIGHT – 1095 LBS.

DIAMETER – 28 INCHES



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HIGHEST, FASTEST, FARTHEST . . .

WOMEN'S RECORDS

CLASS C (Landplanes)

Distance in a straight line (U.S.S.R.)
V. Grisodoubova and Capt. P. Ossipenko. Sept. 24th-25th, 1938.
Soukhoi "Rodina."
5,908.610 km

Altitude (France)
Mlle M. Hilsz. June 23rd, 1936.
1936.
Potez 506. 14,310 m

Maximum speed at low level (U.S.A.)
Miss J. Cochrane. Dec. 17th, 1947.
North American F-51.
663.054 km/hr

Speed over 100 km (U.S.A.)
Miss J. Cochrane. Dec. 10th, 1947.
North American F-51.
755.668 km/hr

Speed over 2,000 km (U.S.A.)
Miss J. Cochrane. May 22nd, 1948.
North American F-51.
720.134 km/hr

Speed over 1,000 km (U.S.A.)
Miss J. Cochrane. May 24th, 1948.
North American F-51
695.780 km/hr

(Seaplanes)

Altitude (U.S.S.R.)
Lt. P. Ossipenko. May 22nd, 1947.
Seaplane *Canot volant*.
8,864 m

Speed over 100 km (U.S.A.)
Miss C. Mowry and Miss E. McCann. Dec. 9th, 1936.
Seaplane *Kitty Hawk*.
337.301 km/hr

CLASS D (Gliders)

Category 1. Single-seaters

Duration returning to take-off point (France)
Mlle. M. Chosnet. Nov. 17th-19th, 1948.
Air-100 sailplane. 35 hr 3 min

Distance in a straight line (U.S.S.R.)
Miss O. Klepikova. July 6th, 1939.
Rot Front 7. 741.263 km

CLASS G (Helicopters)

Distance in a straight line (Germany)
Mlle. H. Rötsch. Oct. 25th, 1937.
FW-61-VID. 108.974 km

PLACE-TO-PLACE RECORDS

Category 1 (Solo)

London—Cape Town (Great Britain)
A. Henshaw. Feb. 5th-6th, 1939.
Percival Mew Gull.
39 hr 25 min
244.876 km/hr

London—Rome (Great Britain)
S/L. Neville Duke. May 12th, 1949.
Hawker Fury.
2 hr 31 min 51 sec
577.6 km/hr

London — Karachi (Great Britain)
S/L. Neville Duke. May 12th, 1949.
Hawker Fury.
15 hr 20 min 27 sec
412.170 km/hr

Cape Town—London (Great Britain)
A. Henshaw. Feb. 7th-9th, 1939.
Percival Mew Gull.
39 hr 56 min
243.745 km/hr

Paris—Hanoi (France)
André Japy. Nov. 18th, 1936.
Caudron *Simoun*.
50 hr 59 min 49 sec
180.308 km/hr

Gibraltar — London (Great Britain)
G/C. Carver. Sept. 19th.
de Havilland Hornet 3.
2 hr 31 min 36 sec
701.192 km/hr

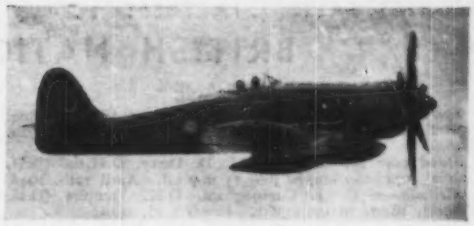
Los Angeles—New York (United States)
Col. W. H. Councell, U.S.A.F. Jan. 26th, 1946.
Lockheed F-80.
4 hr 13 min 26 sec
934.926 km/hr

Paris—Saigon (France)
Mlle. Maryse Hilsz. Dec. 23rd, 1937.
Caudron *Simoun*. 92 hr 36 min
109.316 km/hr

Havana—Washington (United States)
W. W. Edmondson. Nov. 27th, 1947.
North American F-51
3 hr 15 min 13 sec
503.800 km/hr

Washington — La Havana (United States)
W. W. Edmondson. Nov. 27th, 1947.
North American F-51.
3 hr 17 min 28 sec
506.092 km/hr

London—Valetta (Great Britain)
Lt. Cdr. W. R. MacWhirter, Lts. P. C. S. Chilton, D. A. Hook and D. W. Morgan. July 19th, 1949.
Hawker Sea Furies.
3 hr 20 min 49 sec
624.260 km/hr



The Hawker Fury has recently established new London—Rome and London—Karachi records.

Category 2 (Pilot and Passengers)

London — Melbourne (Great Britain)
C. W. A. Scott and T. Campbell Black. Oct. 20-23rd, 1934.
D.H. Comet.
71 hr 18 sec
255.947 km/hr

London—Sydney (Great Britain)
(F/O. A. E. Clouston and Victor Ricketts. March 13th-10th, 1938.
D.H. Comet.
80 hr 56 min
209.712 km/hr

Sydney—London (Great Britain)
F/O. A. E. Clouston and Victor Ricketts. March 21st-26th, 1938.
D. H. Comet
130 hr 3 min
130.777 km/hr

London—Wellington (New Zealand) (Great Britain)
A. Cdre. N. H. d'Aeth, S/L. J. S. Aldridge, F/L. D. D. Hurditch. Aug. 21st-24th, 1946.
Avro Lancaster *Aries*.
50 hr 50 min
313.270 km/hr

Wellington (New Zealand) — London (Great Britain)
F/O. A. E. Clouston and Victor Ricketts. March 20th-26th 1938.
D.H. Comet.
140 hr 52 min
134.306 km/hr

London — Cape Town (Great Britain)
S/L. H. E. Martin and S/L. E. B. Sismore. April 30th-May 1st, 1947.
D.H. Mosquito.
21hr 31 min 30 sec
449.4 km/hr

Cape Town—London (Great Britain)
F/O. A. E. Clouston and Mrs. Kirby Green. Nov. 18th-20th, 1937.
D.H. Comet.
57 hr 23 min
168.257 km/hr

London—Karachi (Great Britain)
A. Cdre. N. H. d'Aeth, S/L. J. S. Aldridge, F/L. D. D. Hurditch. Aug. 21st-22nd, 1946.
Avro Lancaster *Aries*.
19 hr 14 min
330.15 km/hr

London—Darwin (Great Britain)
A. Cdre. N. H. d'Aeth, S/L. J. S. Aldridge, F/L. D. D. Hurditch. Aug. 21st-22nd, 1946.
Avro Lancaster *Aries*.
45 hr 35 min
305.009 km/hr

Los Angeles—New York (United States)
Col. C. S. Irvine, Lt. Col. C. F. Stanley. Dec. 11th, 1945
Boeing B-29. 5 hr 27 min 19 sec
724.826 km/hr

New York—Los Angeles (United States)
Capt. B. L. Grubaugh, Capt. J. L. England. Aug. 1st 1946.
Boeing B-29. 7 hr 28 min 3 sec
578.828 km/hr

Paris—Tananarive (France)
Genin and Robert. Dec. 18th-21st, 1935.
Caudron *Simoun*.
57 hr 35 min 21 sec
151.908 km/hr

Paris—Hanoi (France)
Doret and Micheletti. May 22nd-24th, 1937.
Caudron *Simoun*.
52 hr 46 min 24 sec
159.071 km/hr

Tokyo—London (Japan)
Masaaki Iimuma and Kenri Tsukakoshi. April 6th-9th, 1937.
Mitsubishi *Karigane*.
94 hr 17 min 50 sec
162.854 km/hr

New York—London (United States)
H. T. Merill and J. S. Landis. May 9th-10th, 1937.
Lockheed Electra.
20 hr 59 min
723.345 km/hr

Rome—Rio de Janeiro (Italy)
Attilio Bisen, Magg. Amedeo Paradisi, S. T. G. V. Saccoia. Jan. 24th-25th, 1938.
S-79
41 hr 32 min
221.966 km/hr

Rome—Addis Abbaba (Italy)
M. Laabli, G. Mazzotti, E. Valente. March 6th-7th, 1939.
Fiat BR 20 L.
11 hr 25 min
300.971 km/hr

Berlin—New York (Germany)
A. Henke and R. Freiherr von Moreau. Aug. 10th-11th, 1938.
Focke-Wulfe *200 Condor*.
24 hr 56 min 12 sec
255.499 km/hr

New York—Berlin (Germany)
A. Henke and R. Freiherr von Moreau. Aug. 13th-14th, 1938.
Focke-Wulfe *200 Condor*.
19 hr 55 min 1 sec
320.919 km/hr

Berlin—Hanoi (Germany)
A. Henke and R. Freiherr von Moreau. Nov. 28th-30th, 1938.
Focke-Wulfe *200 Condor*.
34 hr 17 min 27 sec
243.011 km/hr

Berlin-Tokyo (Germany)
A. Henke and R. Freiherr von Moreau. Nov. 28th-30th, 1938.
Focke-Wulfe *200 Condor*.
46 hr 18 min 19 sec
192.308 km/hr

HIGHEST, FASTEST, FARTHEST . . .

BRITISH NATIONAL RECORDS

LANDPLANE

Speed over 3 km.—G/C. E. M. Donaldson, Gloster Meteor (2 Rolls-Royce Derwent), 991 km/hr (616 m.p.h.). Sept. 7th, 1946.

Speed over 100 km.—S/L. J. D. Derry, D.H.108 (D.H. Goblin), 974.0259 km/hr (605.23 m.p.h.). April 12th, 1948.

Altitude.—G/C. J. Cunningham, D.H. Vampire (D.H. Ghost), 18,119 m (59,445ft). March 23rd, 1948.

Distance in Straight Line.—S/L. R. Kellett, F/L. R. Gething and P/O. M. L. Caine, Vickers Wellesley (Bristol Pegasus), Ismailia (Egypt) to Darwin (Australia), 11,520.421 km (7,158.467 miles). Nov. 5th-7th, 1938.

Women's Record

Speed over 100 km.—Miss E. L. Curtis, Supermarine Spitfire II (Rolls-Royce Merlin), 504.0604 km/hr (313.208 m.p.h.). Aug. 28th, 1948.

SEAPLANE

Speed over 3 km.—F/L. G. H. Stainforth, Supermarine S.6B (Rolls-Royce "R"), 655 km/hr (406.991 m.p.h.). November 29th, 1931.

Speed over 100 km.—F/L. J. N. Boothman, Supermarine S.6B (Rolls-Royce "R"), 551.8 km/hr (342.9 m.p.h.). September 9th, 1931.

Distance in Straight Line Without Landing.—Capt. D. C. T. Bennett and I. H. Harvey, Short Mercury (1 Napier Rapier), (Dundee (Scotland) to Orange River (S. Africa), 9,652 km (5,997.752 miles). Oct. 6th-8th, 1938.

Women's Record

Altitude.—Lady Mary Heath, Short Mussel II (Cirrus II), 3,889 m (12,759.809ft). July 15th, 1928.

ROTORPLANE

Speed over 3 km.—S/L. B. H. Arkell, Fairey Gyrodyne (Alvis Leonides), 200.0637 km/hr (124.31 m.p.h.). June 28th, 1948.

POINT-TO-POINT

Of the ten British national point-to-point records, eight are included in the international records on the previous page. Details of the remaining two are as follows:—

London-Paris.—S/L. T. S. Wade, Hawker P.1052 (Rolls-Royce Nene 2), 20 min 27⅘ sec, 994.97 km/hr (618.217 m.p.h.). May 12th, 1949.

London-Gibraltar.—F/L. H. Peebles, D.H. Hornet 3 (2 Rolls-Royce Merlin 130/131), 3 hr 3 min 16 sec, 575.47 km/hr (357.565 m.p.h.).

HAWKER FACTORY FOR AUSTRALIA?

ACCORDING to a news-agency report, an Australian journal has quoted a letter from Sir Frank Spriggs, Hawker's managing director, in which he says he sees no reason why his firm should not consider establishing an Australian factory "provided the project has the blessing and backing of the Australian Government."

The Commonwealth Director of Aircraft Production, Mr. V. F. Fletcher, said that no approach had yet been made to the Government. Mr. R. G. Casey, Minister for Development, described the statement as having "interesting possibilities."

NEW FAIREY PROTOTYPE

PRESENTING his company's report at the 21st annual general meeting of the Fairey Aviation Company, Sir Richard Fairey (chairman and managing director) announced that the Fairey 17 anti-submarine aircraft now on flight trials would soon be joined by another new prototype.

"For reasons of security," said Sir Richard, "I can say little about it, except that in this aircraft we have broken away from the more orthodox type of design, and that its possibilities are even wider than those of the Fairey 17." Both types had been built with the new Fairey system of "envelope jigging" (described in *Flight* of December 1st).

Referring to the company's expanded activities in the field of guided missiles, Sir Richard spoke of the production orders which might well materialize as a result.

BOOKS RECEIVED

The Take Off, by David Beaty. Werner Laurie. Price 9s 6d.

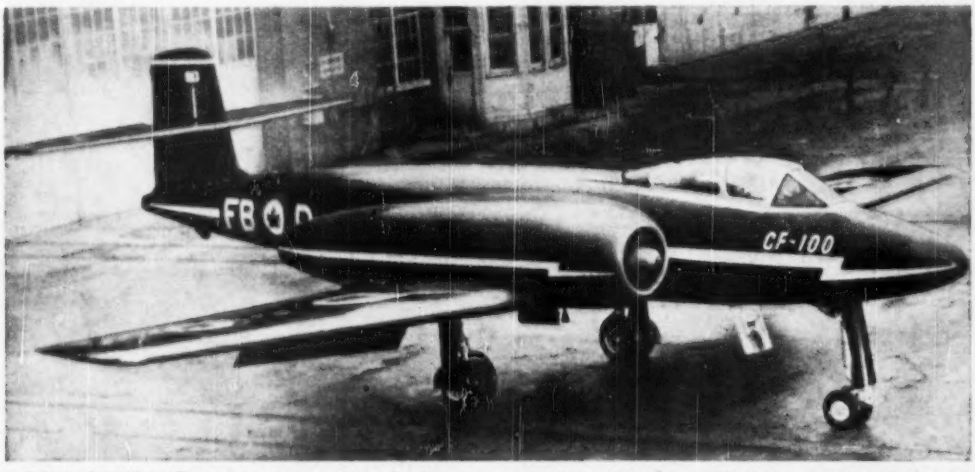
Hot-Tinning, by W. E. Hoare. Tin Research Institute.

Aerials for Metre and Decimetre Wavelengths, by R. A. Smith. Cambridge University Press. Price 18s.

Speed Control Line Models, by R. H. Warring. Percival Marshall. Price 10s 6d.

War in Three Dimensions, by Air Vice-Marshal E. J. Kingston-McCloughry. Jonathan Cape. Price 10s 6d.

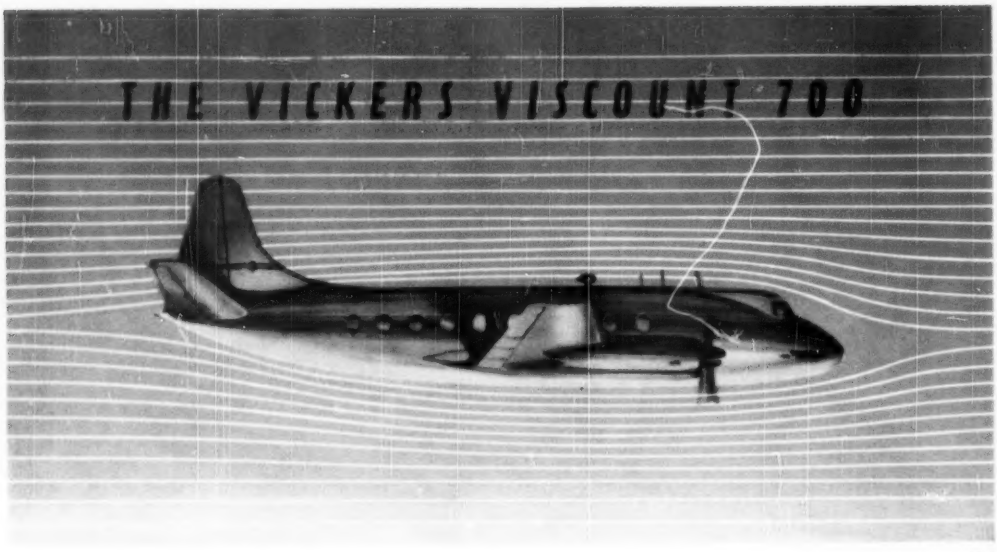
Glossary of Aeronautical Terms (B.S. 185, Pt. 2, 1949). British Standards Institution, London. Price 3s.



HUSKY CANUCK: Though heavily retouched, this first photograph of the Avro Canada CF-100 is nevertheless of interest in depicting the general appearance of this all-weather fighter. The power units of the prototype, which has made initial taxy-ing trials and is to be test-flown by "Bill" Waterton, are Rolls-Royce Avons, and the reported armament, four 30 mm guns. A family resemblance to the Jetliner is discernible in the tail.

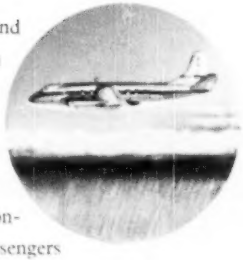
Four "Bristol" THESEUS Propeller-turbines, developing 10,000 h.p., power the HERMES V and make possible still further progress in speed and passenger comfort in this famous series of Handley Page aircraft.

THE *Bristol* AEROPLANE COMPANY LIMITED · ENGLAND

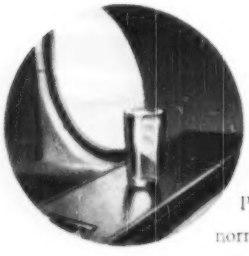


An aircraft that passengers will prefer

The smooth flight of the Viscount will be a new experience for air line passengers—an experience that will win revenue and add to the popularity of air travel. Comfortable seats, large doors and windows are some of the many well-planned details.



25,000 feet up and more comfortable than at home. In the Viscount's pressurised cabin pre-set temperature control and automatic air conditioning enable passengers bound for hotter or colder countries to become acclimatised during flight.



Quiet, vibrationless travel comes from the use of 4 Rolls-Royce 'Dart' Prop-Turbines. Passengers can talk in normal tones and travel fatigue becomes a thing of the past.

Speed—320 m.p.h. Safety—4 engines—kerosene fuel—crash-proof tanks. Add it all up and you've got an aircraft that will set travellers saying: "Book me on the Viscount".

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CIVIL AVIATION NEWS

SCANDINAVIAN REORGANIZATION

THERE has recently been considerable speculation on the possible withdrawal of D.N.L. (Norwegian National Airline) from the S.A.S. system. According to a report from Sweden, the Norwegian Ministry of Communications has informed D.N.L. that, because of unsatisfactory financial results, it must cease participating in the European operations of S.A.S. by April 1st, 1950.

Such a ban would deal a heavy blow to the principle of "Scandinavian co-operation in the air," and the report gives rise to considerable speculation as to the future of the Norwegian carrier. It has been suggested that, in the event of such a breakaway, D.N.L. would operate only limited European services and withdraw completely from the long-range routes, as it could not possibly operate in open competition with a Danish-Swedish S.A.S. due to lack of competitive aircraft. The privately owned Braathens S.A.F.E. company would then, no doubt, have considerable scope for expansion. Duplication of effort and unbalanced organization within the S.A.S. system has been the subject of much criticism in Scandinavia, and until now, has prohibited satisfactory operating results.

A meeting is being held on January 11th in which the full Boards of the three airlines concerned will participate and although it is not certain whether D.N.L. will, in fact, cease operating within the S.A.S. system, drastic re-organization plans are expected to emerge from the discussions.

G.C.A. IN NOVEMBER

THE poor approach-visibility which was prevalent throughout November has resulted in one of the busiest months for G.C.A. personnel at both London and Northolt airports. The monthly report from London Airport, where 343 approaches were carried out, shows that the accuracy with which pilots are now making their controlled approaches has proved that many practice "let-downs" flown in the more favourable conditions of the previous months had been worth while. The direct hand-over from Southern Radar (a microwave early-warning system) to G.C.A. has been further developed during the month.

At Northolt, 714 approaches in all categories were made. Apart from that of Gatow, in the days of the Air Lift, this is believed to be the heaviest traffic carried by any G.C.A. unit in one month. The number of approaches to date at London Airport totals 6,614 and at Northolt 6,144.

INDIAN ACCIDENT

THE report of the committee appointed by the Indian Civil Aviation Department to inquire into the K.L.M. Constellation crash near Bombay on July 12th attributed direct responsibility to an error of judgment on the part of the pilot. The accident resulted in the deaths of 34 passengers and crew. It was stated that the pilot attempted to land by executing a circling procedure (in which the aircraft re-entered low cloud) instead of asking for holding or diversion instructions after he became aware by visual observation of the weather conditions prevailing at the airport. Among the contributory causes of the accident were "the unfamiliarity of the pilot and crew with the topography of the countryside near Bombay and the pilot's failure to adjust engine and aircraft controls to obtain an adequate rate of climb." The Government of India and the Dutch Civil Aviation Department have both agreed with the findings.

B.O.A.C. PROSPECTS

THAT the coming year must inevitably be a particularly difficult one for B.O.A.C. is the view expressed by Sir Miles Thomas in a New Year message to the Corporation's staff. "The rate of deficit is far too high in spite of energetic and far-reaching steps that have been and are being taken to reduce expenditure," the chairman said. "While the long-range prospects for B.O.A.C. are undoubtedly bright it would be quite wrong to take a complacent view of the financial results of the Corporation's current operations."

NOAH'S ARK: The cargo of a York aircraft recently flown from Spain to Liverpool consisted of five lions, two ponies and four monkeys, destined for a circus at Manchester. On landing, it is said, the pilot gave a sigh of relief and reholstered a .45 revolver — although the passenger seen above looks harmless enough.

The aircraft-delivery position was now improving, but the statement intimated that the delay in delivery of the new long-range aircraft, which were ordered a considerable time ago, was in no small measure responsible for the present high rate of deficit. Of the six Stratocruisers due by March, 1948, only one had so far been delivered, the four aircraft which are now operating on the Atlantic route having been taken over from Scandinavian Airlines. The Corporation had not yet received any of the Hermes IVs, said Sir Miles, although the original expectation was that the whole fleet of 25 would be delivered by December, 1949. In fact, the first aircraft is at the moment undergoing a lengthy pre-acceptance examination at the hands of B.O.A.C.'s inspectors.

The new fleet of Argonauts was now complete, but the extension of the Corporation's route-pattern to cover the old B.S.A.A. network—necessitated by the Tudor disaster and their subsequent grounding—had entailed an extended spares provision which had not yet been completed. Apart from the capital loss involved by the withdrawal of Tudors from passenger services the coverage of the routes by the older and less economic Yorks had increased the deficit by £1½ million.

During the coming year devaluation with its consequent higher fuel and station costs would increase expenditure by £1 million, offset to some extent by the £400,000 increase in revenue. A further sum of £1 million for training crews on the new aircraft would have been spent before the increased revenue yield from the new types is forthcoming. Although the administration reorganization of B.O.A.C. was contributing substantially to economies, it had not yet had time to come fully into effect. Sir Miles Thomas continued: "By the early spring we should begin to see the turn of the tide. Already the substitution of Argonauts for flying boats on the Far East routes is showing very encouraging financial results, turning a loss of £320,000 a year into a contribution of £400,000 a year to general overheads. While part of this saving is due to the elimination of the flying-boat bases along the route it gives an indication of what can be expected as the new and competitive fleets of aircraft are brought fully into operation."

Whilst recognizing that the immediate reduction of operating deficit is of paramount importance to B.O.A.C. *Flight* feels that even the Corporation must share our regret at the prospective withdrawal of Solents from service on the Empire routes. The comfort of the flying boat on lengthy overseas services, to say nothing of the psychological "safety" factor on trans-ocean or coastal routes, have made it a firm favourite with passengers, and it is indeed unfortunate that B.O.A.C.,

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as the sole operator of such aircraft on these routes, should alone have to bear the burden of providing and maintaining somewhat costly water-bases. It is even more regrettable in view of the inestimably valuable technical knowledge and operating experience that will be lost if flying boats are taken out of service completely.

Taking the long view, and considering the difficulty and expense of providing suitable airports in comparatively remote parts of the world for aircraft such as the Comet, the Brabazon and even their successors, it may well be that the large flying boat will still provide the ultimate answer to the requirements of long-range intercontinental and trans-oceanic travel. It is in this connection that the development of the Saro Princess is being followed with so much interest.

E.C.A. AIR POLICY

IT is reported from the United States that the new policy of the Economic Co-operation Administration will be to reject future applications by foreign countries for Marshall Plan funds with which to purchase transport aircraft in the United States. This announcement was made simultaneously with the statement that approximately $67,090,000 have been allocated by E.C.A. for purchases of aircraft, engines, parts and ground handling equipment with effect from November 23rd. Recent criticism, both public and Congressional, that the United States was, through the medium of Marshall Aid, financing equipment purchases for State-owned airlines abroad was said to have resulted in the decision to implement the new policy. Many of the foreign aircraft purchasers are direct competitors of American international airline operators.

The latest allocation of funds includes $27,794,000 for the Netherlands, a sum which will be used for the purchase of two Constellations, six DC-6s and 12 Convairs. France has been given $29,029,000 which will be used in part for the procurement of six new Constellations, two used Constellations and nine DC-4s. Applications totalling $4,700,000 have been approved for Italy, whose original intention was to buy DC-6s; the permission recently given, however, was for the purchase of Constellations. The change-over was approved because of the earlier delivery schedules on Constellations. Equipment purchases for Italy are said to have been finally approved on the basis of potential traffic to Rome during this year's Holy Year observances.

Further sums of $2,917,000 and $822,000 were allocated to Belgium-Luxembourg and Denmark respectively. Belgium's purchases of aircraft, spares and engines will, it is said, include six Convairs; Denmark will obtain two DC-6s. Norway was given $872,000 towards the cost of two DC-6s. Allocations of $778,000 for Greece, $149,000 for Ireland and $30,000 for Iceland do not involve the procurement of aircraft. Engines, spares, and ground handling equipment are included in these allocations. A considerable proportion of the funds for Greece is to be used in much-needed improvements at two of Greece's leading airports at present used by aircraft of American airlines.

I.C.A.O. IN 1949

REVIEWING the progress of I.C.A.O. during 1949, the secretary-general, Dr. Albert Roper, says (in a special article in the *United Nations Bulletin*) that although there was little of the spectacular in the history of the past year, there was certainly much concrete achievement. In the technical field I.C.A.O. completed the first series of regional air-navigation meetings for the ten world air-navigation regions, and considerable effort was also made to expand the scope of international standards and recommended practices. Among those approved during the year were standards for airworthiness and aeronautical tele-communications.

Considerable progress was also made with the joint support programme, designed to help finance and operate air-navigation facilities in parts of the world where otherwise they could not be maintained. As a result of the special joint support meeting held in London in the Spring of 1949, two specific agreements are now in effect: the first, designed to continue the floating weather-station network in the North Atlantic, provides for the maintenance of ten floating stations, each requiring 25 ships for their continuous operation. The vessels at present in use belong to five North Atlantic nations, and the contributions from six more countries helped to defray part of the cost. The second result of the meeting was the agreement by which nine I.C.A.O. nations contribute to pay for weather-stations and communication facilities in Greenland and for Lotan station at Skuvanes in the Faroe Islands. Facilities are operated by Denmark, but as they are used internationally I.C.A.O. member-nations have agreed to reimburse Denmark for the major proportion of the cost of operation.

In the economic field, says Dr. Roper, I.C.A.O. concentrated on the duties assigned to it by the 1948 Assembly Council. It approved an annex on the facilitation of international air transport by reduction of time-consuming formalities, and careful studies were made of the cost and charges relating to the transportation of air mail, of burdensome insurance and of the multiple taxation of international airlines; the methods which might be used to levy charges for the use of air navigation facilities were also under consideration.

Dr. Roper concludes by expressing the hope that in fostering the growth of international civil aviation I.C.A.O. will help to create and preserve friendship and understanding among the nations and peoples of the world.

FLIGHTS ABROAD

CONFIRMATION of the existing regulations governing non-scheduled flights by civil aircraft from the United Kingdom to points abroad is contained in M.C.A. *Information Circular No.* 143 of December 21st. The Circular states that, as facilities for such flights to most places abroad are still limited and subject to various special requirements, any person desiring to make a flight should communicate with the M.C.A., giving full particulars of the proposed flight, as detailed in the notice.

The regulations apply equally to private and commercial aircraft. Although an initial interpretation might lead the reader to believe that M.C.A. permission is required for a private week-end trip to, say, Deauville, a different construction can be obtained by a study of previous notices (detailed in the Circular) dealing with passport, visa and other requirements for civil flights to specific destinations.

Clarification of the information contained in this Circular appears necessary. For instance, there is, to our knowledge, no difficulty about making private flights to destinations in France, Belgium, Holland, Denmark, Sweden, Switzerland and Luxemburg; facilities for such journeys can easily be arranged through the Royal Aero Club.

YUGOSLAV AGREEMENT

BY the terms of an agreement concluded between the United States and Yugoslavia, American aircraft are permitted to fly over Yugoslavia and to land at Belgrade and other airports. Similarly, the Yugoslav National Airline was granted the right to land at all suitable airfields in the U.S. zones of Germany and Austria in order to discharge and embark international passengers.

Pan American Airways should benefit

ISRAEL'S OWN: The DC-4 *Rechovoth*, shown on arrival at London Airport, inaugurated the first Lydda—London service of the newly formed Israel National Airlines (El Al). The occasion was marked with due ceremony and the aircraft was greeted on arrival by Israeli diplomatic representatives and by the airport commandant, Air Marshal Sir John d'Albiac.

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by the agreement, since their operations in Europe cover this area. The P.A.A. New York-Calcutta flight will probably make the stop at Belgrade. Previously, American aircraft had to make an 800-mile diversion to by-pass Yugoslavia on their routes to the Middle East; it is thought that south-bound aircraft will now make their first stop after Belgrade at Istanbul.

Under the conditions of the agreement the flights will be regular, but neither party is obliged to observe any specified stop on its routes. Among the mutual rights conferred are included those of transit, embarkation and discharge of international traffic and passengers, freight and mail. An additional clause provides that, on request from either party, the agreement may be re-examined with the view to expanding its scope, thus providing for the possible future establishment of a Yugoslav transatlantic service.

JUNGLE JIM: Gaily bedecked with paintings, the DC-4 shown above on arrival at Northolt is the first Ethiopian aircraft to fly to this country. The decorations are said to have been intended to amuse the natives.

WORLD TRAFFIC

FIGURES compiled by I.A.T.A., and published by the Director-General, Sir William P. Hildred, in an annual report, show that the world's scheduled airlines carried more than 25,000,000 people during 1949. A scheduled airliner was taking off or landing every five seconds of the day and night at one of the world's thousands of airports.

Loads averaged more than 70,000 passengers a day throughout the year, and aircraft made approximately 11,000 scheduled flights across the North Atlantic alone—an average of 30 a day. More than 10,000 passengers per day were flown by scheduled carriers in Europe.

Sir William observes that the figures for 1949 were considerably greater than those for the previous year, and predicts that even greater increases will be seen in 1950 when, in addition to the normal annual increase, the special excursion and group-fare concessions, together with the Holy Year celebrations in Rome, will have considerable effect on the year's results.

BREVITIES

Air India International is reported to be considering the purchase of a number of D.H. Comets. The president of the company, Mr. J. R. Tata, was greatly impressed by the performance of the Comet at Farnborough, and has subsequently discussed the matter with the de Havilland Company.

* * *

In order to face strong foreign competition in maintaining international services, the Government of Brazil is now considering a Bill to subsidize Brazilian airlines operating to places abroad.

* * *

The secretary of the Indonesian Civil Aviation Department, Dr. Sugoto, is now in Australia studying civil aviation methods from which Indonesia will take the pattern for the development of her own air-transport system.

* * *

In 1949 the Lockheed Aircraft Corporation completed the sale of 42 new Constellation aircraft to major world airline operators. This brought the company's financial backlog for commercial aircraft to a total of $45,000,000 for the year. The total number of Constellations which have either been delivered or are on order to 14 of the world's major airlines is given as 219.

* * *

Eagle Aviation, Ltd., has recently purchased three York aircraft from B.O.A.C. The Yorks have been converted at the company's maintenance base at Aldermaston for freighter-passenger work; the cabins are equipped to accommodate up to 46 passengers.

* * *

Both the Consolidated Vultee Aircraft Corporation and the Glenn L. Martin Company are understood to be planning to use Allison T-38 turboprops in experimental versions of the twin-engined Convair and Martin 2-0-2 transports. It has also been suggested that T-38 and T-40 turboprops may be selected to power future versions of the Fairchild C-119 and C-120 and the Douglas C-124 Globemaster transports.

* * *

The Canadian Parliament has been informed that Government subsidies to the extent of $5,000,000 have been provided to assist in the construction of jet aircraft by Avro (Canada), Ltd. The subsidies commenced in 1947, under an agreement by which the Government promised contributions towards the cost of the development of two C-102 Jetliners. When the aircraft have been completed, the Government will take delivery and pay any costs in excess of the subsidies. It was said that the de Havilland Company of Canada had received no Federal assistance since 1947.

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B.O.A.C. announces the appointment of Mr. Basil Smallpiece as financial comptroller to the Corporation. Mr. Smallpiece was previously director of costs and statistics with the British Transport Commission.

* * *

After prolonged negotiations with the Customs authorities, Air France has reached an agreement whereby their passengers from London Airport have facilities for sending luggage in advance, as on the railways.

* * *

Air France is understood to be considering the ordering of a number of Breguet 761 four-engined transports. It has not yet been decided, however, with what engines the aircraft will be equipped. The S.N.E.C.M.A. 14R, the Bristol Hercules and a Pratt and Whitney engine have all been suggested.

* * *

A new 260 h.p. Lycoming-engined "Super" Navion, which will cruise at 170 m.p.h., has been announced by the Ryan Aeronautical Company. Deliveries are scheduled to begin in March, and the price is said to be $14,000 for the completely equipped aircraft.

* * *

United Airlines have placed an order for six new Douglas DC-6B transports. The order is in addition to five new DC-6s ordered last August, and will now augment the company's fleet of DC-6-type transports to 50. The DC-6B is priced at over $800,000. The company's entire fleet to date comprises some 138 aircraft.

* * *

A project whereby the United States' Navy would lease its two Lockheed XR-60 Constitution four-engined heavy transports to airlines is reported to be under consideration as a means of preventing the aircraft from being grounded due to lack of operating funds. Although operating cost of the Constitution is about three or four times that of the DC-4, it is understood that several airlines are considering the possibility of using the large aircraft on "coach" services, thus taking full advantage of its 180-passenger seating capacity.

* * *

The chairman of the Scottish Advisory Council on Civil Aviation, Sir Patrick Dollan, recently announced that the number of passengers on the Glasgow-London route for the period April to November has increased by nearly 10,000 to

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26,154, as compared with the same period of last year. The Edinburgh-London route has also shown an increase of almost 5,000, to a total of 11,419. The number of passengers on all routes in October was 11,320, of which 2,730 were carried on the Glasgow-Belfast services. Sir Patrick also intimated that in 1950 Scotland would have direct air services to Europe provided by B.E.A.

* * *

A suggestion that a considerably lower U.K.-Australian fare would encourage an increase in the number of travellers has been made by Capt. Ivan Holyman, managing director of A.N.A. Basing his claim on the experience of A.N.A. charter flights on this route, he said that aircraft are available which could operate immediately at a fare of £A200 as compared with the present figure of £A325.

* * *

Statistics recently issued by the American Immigration and Naturalization Service show that during the past 12 months the total number of passengers travelling by air between the United States and foreign countries was 20 per cent higher than the total of passengers by sea. The figures do not include traffic crossing the land borders of the U.S., nor that between the U.S. and American overseas possessions such as Hawaii and Puerto Rico.

* * *

Pan American Airways announce increased frequencies on the trans-Atlantic Stratocruiser services to ten flights weekly. There are now daily flights between New York and London, and three weekly between New York and Frankfurt. The airline is also increasing to three times weekly its "President" flights on this route, which (at a slightly increased fare) provide *de luxe* meals together with champagne and music; the seating layout provides for 28 berths and 17 sleeperettes.

* * *

In connection with the Holy Year celebrations in Rome, a special inclusive-tour fare of $640 (£266) is being offered by T.W.A. The figure is based on the new trans-Atlantic 15-day excursion fare, and in addition to round-trip air transportation permitting stops at Rome, Florence, Genoa, the Riviera and Paris, the fare includes all ground transportation abroad, hotel accommodation, meals, baggage transfer services, sightseeing trips, services of guides and all entrance fees to museums and public buildings.

* * *

With effect from January 15th, seven round-trip Stratocruiser flights weekly will be flown by United Airlines between San Francisco and Honolulu. The new services will permit travellers to Hawaii the choice of either the 9½-hr. daylight flight on four days a week, or equally fast overnight trips on the remaining three days. Unusual spaciousness has been achieved by an arrangement to accommodate 55 on the main deck instead of the aircraft's maximum capacity of 114. Seven new Stratocruisers are scheduled for delivery to the company in the near future.

* * *

Portsmouth Airport has now been derequisitioned, and the City Corporation has purchased all buildings erected by the Ministry of Supply during the war. A 99-year lease has been granted to Airspeed, Ltd., and a further lease to Portsmouth Aviation, Ltd., for the premises which both firms occupy on the airfield. The terminal building is to be renovated and, together with the service hangar, will be maintained by the municipal authorities for the use of commercial operators and visiting aircraft.

FROM THE CLUBS

WITH the object of enabling more members to fly, Cowes Aero Club is endeavouring to provide considerably reduced rates for the first four months of this year. The rates quoted are as follows:—

Aircraft	Dual	Solo
Tiger Moth	£3 0	£2 10
Auster Autocrat	£2 10	£1 15
Auster Arrow	£2 0	£1 10

The offer is subject to a minimum of 25 hours' flying and payment is to be made in advance. In view of the low rates, however, no refund will be allowed if the 25 hours are not completed. The club also announce new daily hire charges for the Autocrat as being seven guineas and for the Arrow five guineas, including full petrol tanks, which will permit three hours' flying; thus, if all the passengers are pilots, this charge is even more economical than the rates quoted for solo flying. Landing cards are supplied with the aircraft at a charge of 5s per day, and additional fuel can be supplied on request. The club is also able to arrange accommodation at low rates.

This would appear to be an encouraging step towards bringing the cost of flying nearer to the pocket of the average enthusiast.

* * *

BECAUSE of the disappointing financial results of the National Air Races, held at Elmdon in August last year—only the final day of the meeting attracted a large crowd—the Royal Aero Club is undertaking the experiment of allotting the various races to individual flying clubs. The series will thus be held at a variety of venues and on different dates, and these details have now been announced.

The King's Cup Race will be flown on June 17th, at the meeting organized by the Wolverhampton Aero Club. The international race for the Kemsley Challenge Trophy has been allotted to the Swansea and District Flying Club, and will be contested at Fairwood Common on August 19th. The S.B.A.C. Challenge Cup for jet aircraft—"the world's fastest race"—will be held at the Yorkshire Aeroplane Club's meeting at Sherburn-in-Elmet, near Leeds, on July 22nd, and the international high-speed handicap for the Air League Challenge Cup will also be contested at this meeting. Newcastle Aero Club has been allotted the international Grosvenor Challenge Cup and Norton Griffiths Challenge Trophy races, which they will fly at Woolsington Aerodrome, Newcastle, on July 15th, and the Coventry Aero Club's meeting at Baginton on September 2nd will include the Siddeley Challenge Trophy Race.

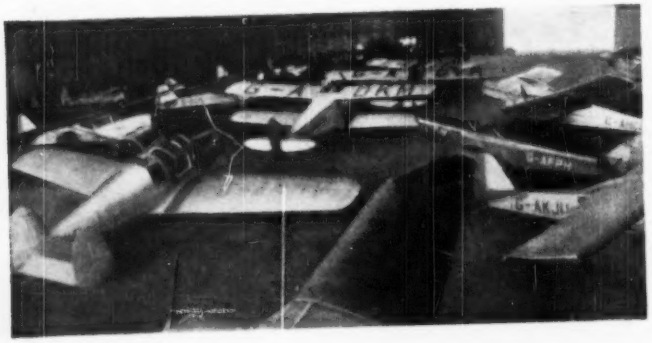
Trophies and prize money to the value of £2,480 are being donated by the Royal Aero Club, the Kemsley Flying Trust and the S.B.A.C. to the successful contestants in these events. The dates mentioned above are provisional.

* * *

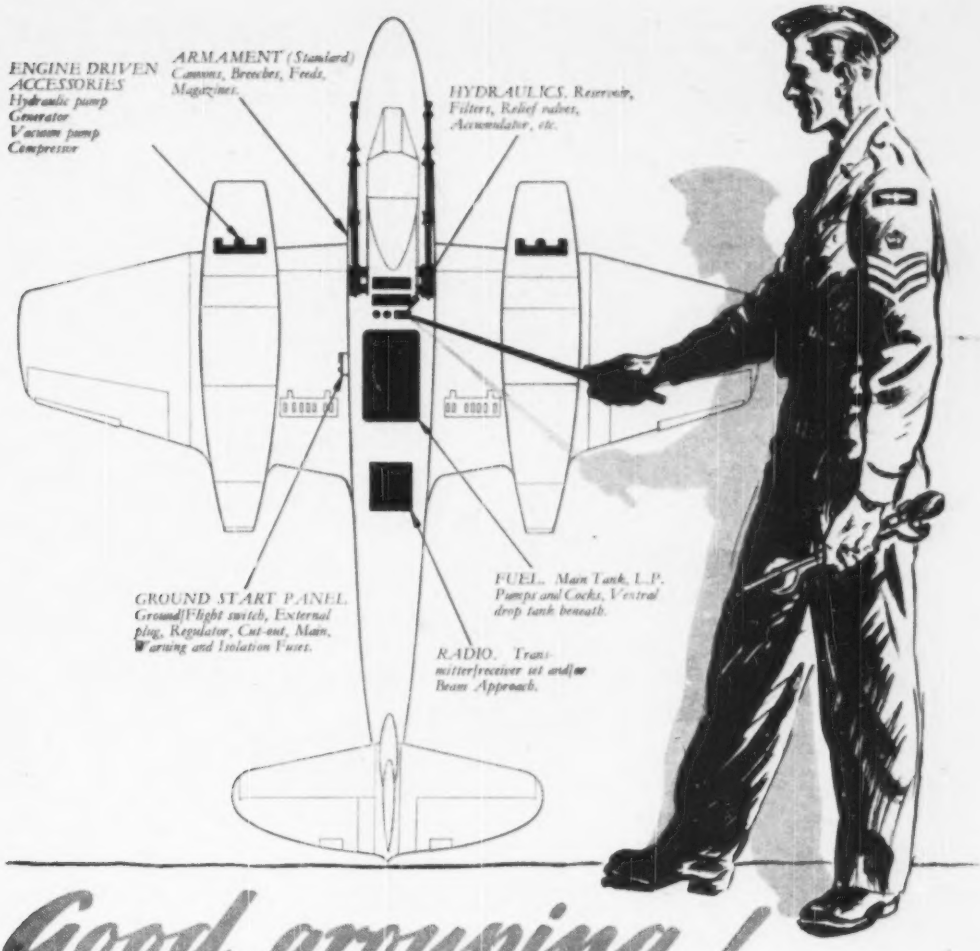
DESPITE the bad flying weather throughout November, the Wiltshire Flying Club achieved a very satisfactory time of 140 hours, bringing the 1949 total (to the end of that month) up to 2,047 hours. During this January-November period, 56 new private licences were obtained. The number of club members who own and operate their own aircraft from Thruxton has now risen from six in 1948 to 14.

* * *

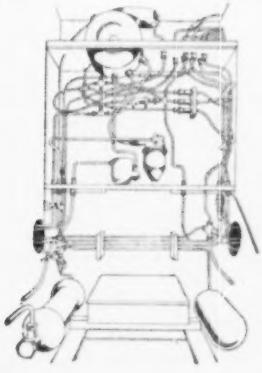
MR. C. COLIN COOPER has left the R.Ae.C. to become United Kingdom representative of United Helicopters, Inc., who, as makers of the Hiller, are the world's largest manufacturers of commercial helicopters. His address is 30, Chelsea Square, London, S.W.3.



WORK IN HAND: Early preparation for the activity of the summer season is apparent in this photograph of club and privately owned aircraft undergoing overhaul and repair at Thruxton Aerodrome, in the hands of the Wiltshire School of Flying, Ltd.


ENGINE DRIVEN ACCESSORIES
Hydraulic pump
Generator
Vacuum pump
Compressor
ARMAMENT (Standard)
Cannons, Breeches, Feeds, Magazines.
HYDRAULICS. Reservoir, Filters, Relief valves, Accumulator, etc.
GROUND START PANEL
Ground/Flight switch, External plug, Regulator, Cut-out, Main, Warning and Isolation Fuses.
FUEL. Main Tank, L.P. Pumps and Cocks, Ventral drop tank beneath.
RADIO. Transmitter/receiver set and/or Beam Approach.

Good grouping!



On the Meteor 4, components of the hydraulic system are collectively grouped on the rear bulkhead of the magazine bay. In a similar manner, components of all other systems are in readily accessible positions throughout the aircraft. This is but one of the many features which have established the Meteor's high standard of serviceability under a wide variety of fully operational conditions.

GLOSTER **METEOR**

For Easily Maintained Airpower

GLOSTER AIRCRAFT CO. LTD. (BRANCH OF THE HAWKER SIDDELEY GROUP LTD.)

DE HAVILLAND TURBINES

for the optimum combination of reliability and performance

GOBLIN

The Goblin is approved for an overhaul life of up to 600 hours and a rating of up to 3,500 lb.

THE DE HAVILLAND ENGINE COMPANY LIMITED, EDGWARE, MIDDLESEX, ENGLAND

DH ENGINES

HERE and THERE

NENE-POWERED: Although at present classified as "experimental," France's largest jet aircraft, the SO 4000 (two Rolls-Royce Nenes) is taking shape as a promising jet-bomber prototype for the French Air Force. This first photograph shows it under construction at the Courbevoie works of S.N.C.A. du Sud-Ouest.

New A.S.T. Students

FIFTY officers and N.C.O.s of the Iraqi Air Force will shortly begin a period of aeronautical training in Britain, by an arrangement between the Iraq Government and Air Service Training, Ltd. The majority of them will take a course in aircraft engineering at Anstey, near Coventry, and the others will be trained as pilots at the company's flying school at Hamble, Southampton.

Testing the Brabazon

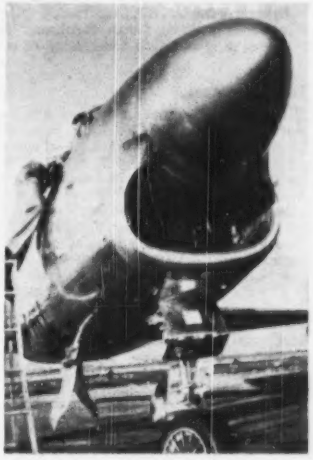
SPEAKING to members of the Bristol Junior Chamber of Commerce last week, "Bill" Pegg, chief Bristol test pilot, said that the Brabazon had completed 26 hours' flying in 13 test flights to date. Additional equipment, added between each flight, had increased the time taken to accumulate flying hours.

The Brabazon, said Mr. Pegg, had put Britain on the aviation map fairly and squarely. If the Americans tried to build a similar aircraft it would be seven or eight years before they could operate it. Referring to test-flying, he said that pilots should not be classed with circus performers or wall-of-death riders—"There are risks, of course, but they are well assessed and discussed before they are taken."

D.H. Engine Appointment

IT is announced that Mr. John Grierson has joined the staff of Mr. H. Buckingham, business director of the de Havilland Engine Company, and that he will undertake general executive duties relating primarily to the interests and problems of civil and Service users of D.H. engines.

Well known both as a pilot and an author, Mr. Grierson has been Deputy Director of Civil Aviation in the British Zone of Germany for the past two years. His flying experience dates from 1925, and includes service in the R.A.F., some notable long-range flights in Gipsy-engined Moths, seven years as a test pilot (during which he took part in flight-testing the first Gloster jet aircraft), and a period in charge of whale-spotting Walruses in the Antarctic.



FACE-LIFT: New nasal configuration of the North American YF-86D, latest version of the record-holding Sabre jet fighter. In addition to the extended nose, the YF-86D is also notable for the provision of an afterburner in the rear fuselage, increasing the power of its J-47 turbojet.

Lone Star Trainer

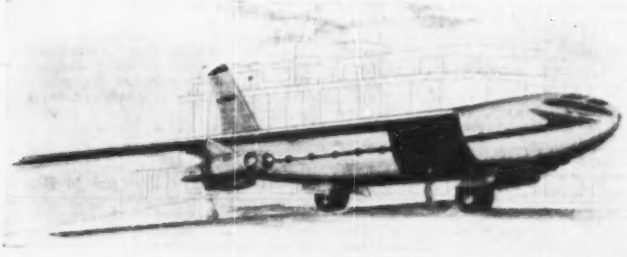
FOLLOWING a competition between employees of the Texas Engineering and Manufacturing Company, the name Buckaroo has been selected for the company's 145-h.p. T-35 primary trainer. The name—which means a bronco-busting cowboy—was chosen to mark the aircraft's association with the State of Texas.

The first production Buckaroo is due to be completed this month, and although no U.S.A.F. orders for the type have been announced, the manufacturers report that interest has been shown by a number of overseas countries.

Bristol S. African Representative

AIR COMMODORE J. H. C. WAKE has been appointed the Bristol Aeroplane Company's representative for South Africa, Northern and Southern Rhodesia and Portuguese East Africa. Until his recent retirement from the R.A.F., A. Cdre. Wake was Deputy Director of Military Aircraft Research and Development at the Ministry of Supply (Air). His Service experience was long and varied and included three years of test-flying at Martlesham Heath, a period as chief ground instructor of the R.A.F. College, Cranwell, and close contact with the industry while Assistant Chief Overseer of the wartime Ministry of Aircraft Production.

A.Cdre. J. H. C. Wake.



STRATOJET IN CIVVIES: This impression of a four-jet airliner is stated by the Boeing Company to illustrate one of its several recent design studies. Like the six-jet Boeing B-47 Stratojet, to which it bears an obvious relationship, the design is seen to have "pod" power-units slung beneath thin, swept-back wings. Shortage of fuel-space, other than in the fuselage, would appear to be one major disadvantage of such a layout.

Lively Latins

ACCORDING to recent reports from the Argentine, parachuting has become a fairly popular pastime. It is recorded, for example, that Vincente Bonvisuto, an N.C.O., recently broke his own parachute-jumping record by

HERE AND THERE . . .

making 100 descents from a Piper Cub in just over eight hours.

At a flying club near Buenos Aires, a 19-year-old girl made nine jumps, also from a Cub, in 40 minutes; and a new note was struck by another intrepid lady, who used two parachutes in succession, discarding the first, during a single descent.

A third Argentine aviatrix, Señora de Oyamzu, recently set up a new record for the greatest number of loops completed in succession. Flying a 65 h.p. El Boyero light aircraft, she looped no fewer than 237 times, at a reported rate of "six flings a minute."

Spotters' Contest

THE third annual contest of the Aircraft Recognition Society is to be held in the Science Museum, South Kensington, at 4.30 p.m. on Saturday, January 21st. Competing teams will each consist of three persons, not under the age of 16, representing any Service or civilian organization interested in aircraft recognition, and the test comprises 35 flying views of modern aircraft.

The winning team will receive from Mr. Peter Masefield, the president of the Society, a trophy consisting of a solid silver model of a Hurricane, at present held by the Barking Aviation Club. Entry forms, together with a fee of 7s 6d, must be sent to the chairman, Mr. E. G. A. Wilton, Laymorna, Taymount Rise, London, S.E.23, before next Saturday, January 7th.

BROUGHT UP TO DATE: B.O.A.C.'s director of technical development, Mr. A. C. Campbell-Orde, was one of the first British airline captains, and also a test pilot, during the inter-war years. He is seen leaving the second prototype Ambassador after a flight made during a recent visit to the Airspeed factory at Christchurch.

MUSTANGS AT KITTY HAWK: North American F-51 Mustang piston-engined fighters of the U.S.A.F. in spectacular passage over the Wright Brothers' hilltop memorial at Kitty Hawk, North Carolina. The fly-past was part of the celebrations commemorating the 45th anniversary of the first powered flight.

Not So Fast

LAST week's report in the *Los Angeles Times* that the Bell X-1 research aircraft had flown at Mach 3—a speed of practically 2,000 m.p.h. at the altitudes involved—drew an official statement from the U.S. Air Force, to the effect that the X-1 had flown "hundreds of miles per hour faster than sound," but that specific figures were still secret. Recent reports of specific speeds were described as incorrect.

The Bell X-1 first achieved supersonic speed on October 14th, 1947, and the latest X-1A version is said to have a maximum designed speed of 1,700 m.p.h. (approximately Mach 2.6) at 80,000ft. The X-1A is fitted with a 6,000-lb thrust rocket-unit with turbo-pump fuel system. Its endurance is 2½ minutes at full thrust.

NEWS IN BRIEF

THE Argentine Air Force is reported to have shown interest in the Saab Scandia twin-engined transport, which was demonstrated recently in Buenos Aires.

* * *

Mr. Stephen J. Mattock has been appointed publicity manager to Venner Time Switches, Ltd., New Malden, Surrey. He previously held posts with Rolls-Royce, Ltd., the General Electric Co., Ltd., and in technical journalism.

* * *

Avica Equipment, Ltd., is the new title of Aviation Corporates, Ltd., 53, Pall Mall, London, S.W.1. The change has been made in order to identify the firm more closely with its American company, Avico, Inc., Portsmouth, R.I.

* * *

Mr. J. G. Scott, who recently joined Electro-Hydraulics, Ltd., Warrington, has been appointed supplies manager of the firm. For a number of years Mr. Scott was with General Aircraft, Ltd., Feltham, and Miles Aircraft, Ltd., Reading, in various capacities on the material-supply side.

Miss Thorn, daughter of the late Capt. S. A. ("Bill") Thorn, Avro chief test pilot, is to marry Lt. Cdr. E. D. Hanson, a test pilot at R.N.A.S. Anthorn, Carlisle.

* * *

The engagement is announced of F/L. Duncan E. de la Hoyde to Miss Stella Howse; both were formerly at the Royal Aero Club, and Miss Howse is now with R. K. Dundas, Ltd.

* * *

At the recent annual meeting of the Air Transport Section of the London Chamber of Commerce, Mr. J. Vivian Holman was elected chairman of the section in succession to Mr. J. S. Wills, and Mr. A. M. Desoutter was re-elected deputy chairman.

* * *

S/L. Bob Moore, who for the past three years has been chief experimental test pilot to the Swedish Saab firm, and before that was a Rolls-Royce test pilot, is to act as technical representative of the Royal Swedish Air Force and Saab in London. He can be communicated with c/o the Swedish Embassy, 29, Portland Place, W.1.

* * *

Orders for helicopters and spare parts placed recently with the Kaman Aircraft Corporation by the U.S. Navy and Coastguard have raised the company's "military backlog" to nearly £40,000. The new contracts cover helicopters and spare parts to be delivered during the year, and two previous Navy orders were for helicopter research and development.

* * *

Appearing this month, the 1949-50 *F.B.I. Register* runs to over 1,000 pages in which nearly 6,000 firms in British industry are catalogued under cross-referenced headings. The register is published at 25s (with special terms to F.B.I. members) jointly by Kelly's Directories, Ltd., and Iliffe and Sons Ltd. Home orders should be addressed to the first-named firm at 186, Strand, London, W.C.2, and overseas orders to the latter, at Dorset House, Stamford Street, London, S.E.1.

rounding the half-century mark

In wishing you a successful New Year we are reminded that the half century just completed covers almost the entire history of flying—only a little longer than Avro's own lifetime. That lifetime has been continuously concerned with the development of flying. As one example, the R.A.F. has never been without an Avro trainer. Latest contender for the honour of perpetuating this enviable record is the Avro Athena high performance advanced trainer.

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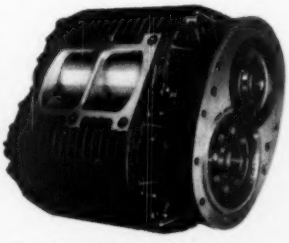

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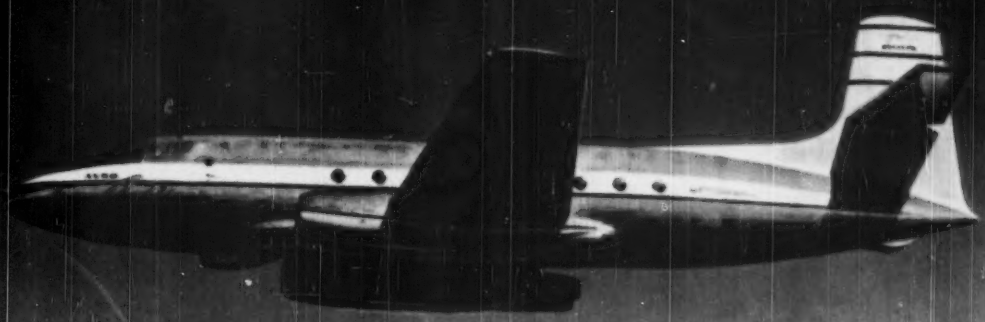


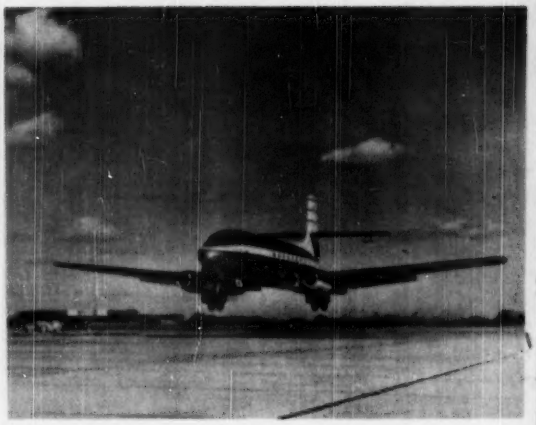
CANADIAN CONTENDER

"Flight" Looks Over the Avro Jetliner at Malton

SINCE Mr. E. H. Atkin, chief designer of Avro Canada, visited this country to deliver the Commonwealth and Empire Lecture, the estimated performance and economics of his Jetliner have been much discussed. Before this, its principal features were well known, and now there is ample evidence to indicate that the early flight trials of the prototype have been proceeding rapidly and satisfactorily. A wheels-up landing on the airfield at a very early stage caused little damage or delay, and recently it was announced that measured performance was proving rather higher than that estimated. In layout and construction the Jetliner is modern but conventional, and the fuselage is definitely spacious. Before giving some personal impressions formed during a brief examination of the Jetliner, it may be useful to recall the main features of the aircraft.

It is, of course, a four-jet, low-wing, nosewheel design. The four Rolls-Royce Derwents, each of 3,500 lb thrust, are underslung in paired close-in nacelles and they have large, circular, individual air intakes. The wing is of conventional two-spar construction with heavy-section skin to provide torsional stiffness. Two main outer wing sections each contain two integral fuel tanks, and small tip sections complete the wing structure. The whole of the trailing edge is occupied by ailerons and landing and dive flaps. Very long lead-in wing fillets are a feature of more than one Avro Canada design. The fuselage, 10ft in diameter,

Conventional and spacious, yet designed to take advantage of its turbojet power, the C.102 is a handsome machine.



The head and tail features of the Jetliner. On the right, she has just left the ground at Malton. Take-off and landing characteristics have proved to be well up to expectations. The tailplane and elevators are well clear of the jets.

CANADIAN CONTENDER . . .

is pressurized, and for production is divided into a nose portion, centre section (integral with wing centre-section), rear main fuselage, tail section, and, finally, the tail cone.

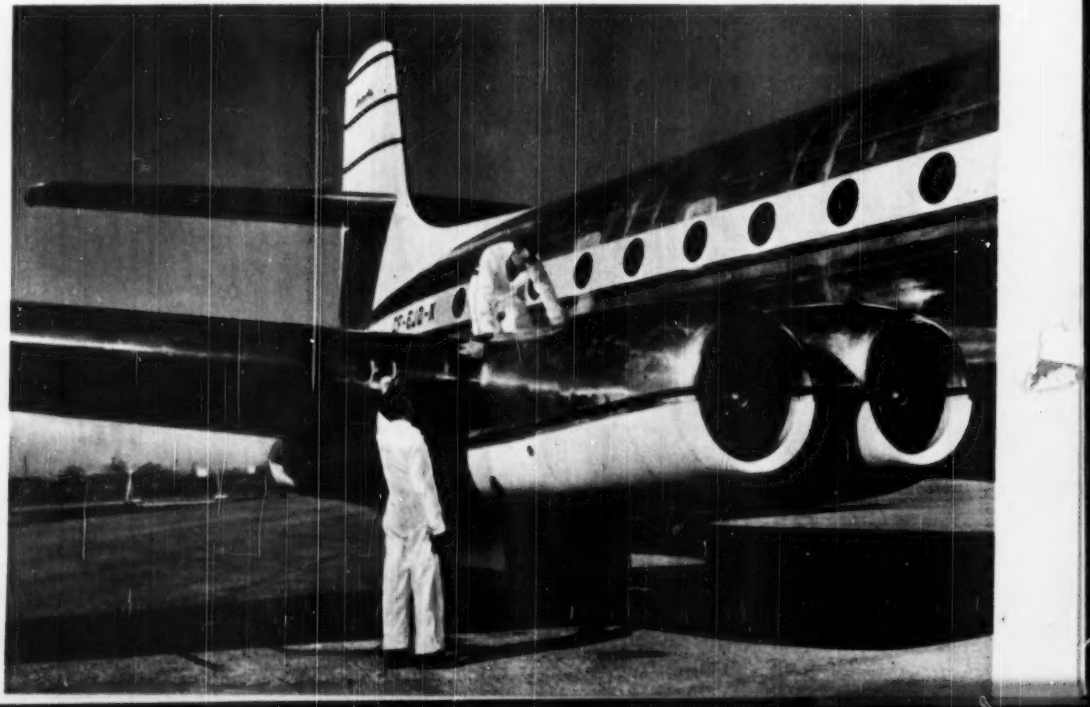
On the prototype, both the rudder and the elevators started off as double surfaces, the forward one working on the corrector principle and piano type hinges being used. The forward surface is power-operated in each case, and the rear one, carrying the trimmer, is manually-operated. Following initial flight trials it was decided to dispense with the servo rudder surface, which had proved to be unnecessary, and to retain only the manual rudder. While the aircraft was in the hangar for its first inspection (during November) this was one of the alterations made. The ailerons, which occupy some 53 per cent of the outer-wing trailing edge, are power-assisted hydraulically (5 : 1 ratio).

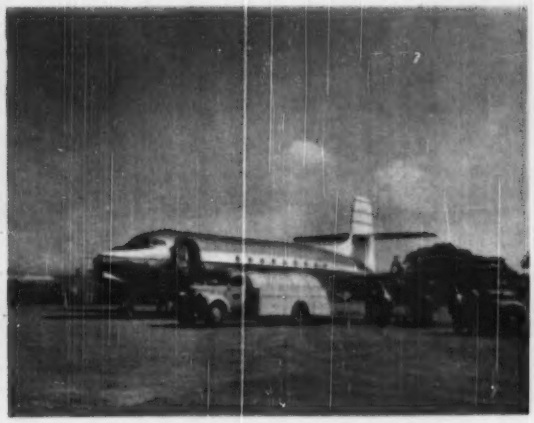
Squat, twin-wheel, Dowty tricycle landing-gear is fitted. Its operation is electro-hydraulic, as is the nosewheel steering, and all wheels fold forward—the main wheels to tuck up between the Derwent jet pipes.

The fuselage layout will probably be for 50-60 passengers, the aircraft being for high-density, inter-city travel with stage-lengths of 400 to 500 miles. Dimensions and preliminary performance figures are tabulated (page 22).

To anyone who has been able to examine the Comet, Viscount, Apollo and other contemporary transports, the Jetliner at close quarters seems unexpectedly large. The fuselage, in particular, is distinctly rotund. It will, in fact, hold up to 72 seats without reducing comfort or pitch below that in use on world airlines to-day. The Derwent nacelles also appear large though shapely and, with their jet-pipe extensions, very long. The turbojets are suspended, and their lower main cowling panels hinge outward to give very good accessibility. A small deflection of the jet pipes is required to allow clearance around the main-wheel units.

The size of the double nacelle for the Rolls-Royce Derwents is accentuated by the attendant ground crew.





Pre- and post-flight activities. (L. to r.): J. C. Floyd, project designer; Jimmy Orrell, Avro chief test pilot; A.W. Baker, flight engineer; Don Rogers, chief test pilot, Avro Canada; H. Garside, assist. production manager; W. N. Deisher, vice-pres. and general manager.

Cold air circulates over the pipes, which are lagged and loosely jacketed, flow being induced venturi-wise by the jet nozzles. The double nacelles are separated by a fire-proof bulkhead, and are again sub-divided into compartments. The ill-wind of the early wheels-up landing did, it seems, serve one useful purpose at least: it enabled the designers of the nacelles and power plants to confirm that under emergency conditions the extinguishing medium did in fact get to all the right places according to plan. There was no sign of fire.

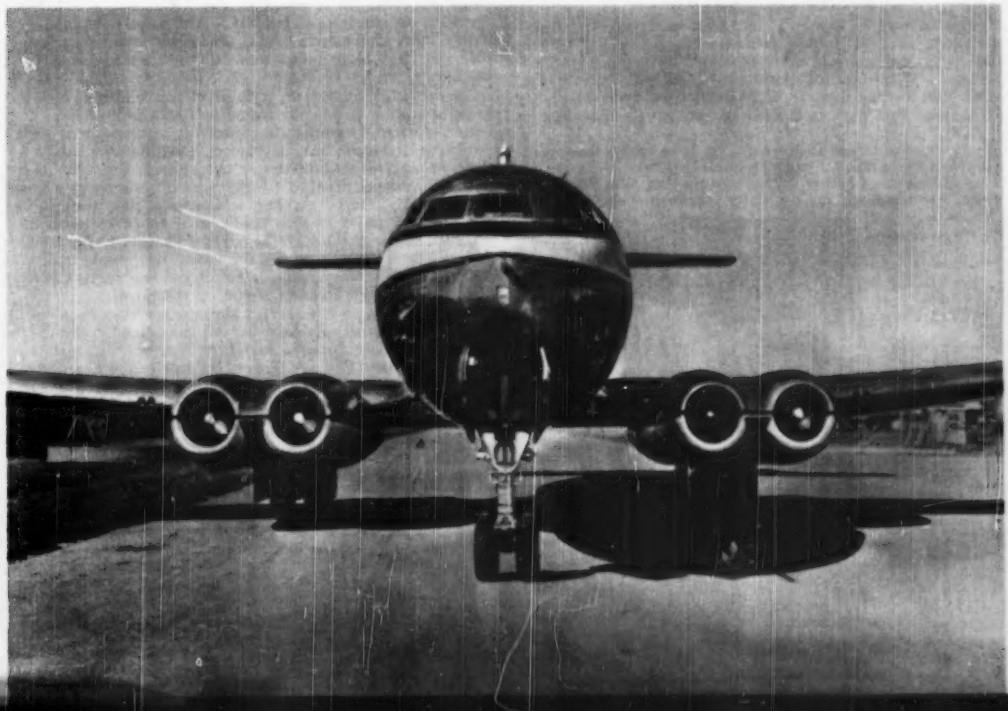
Derwents are very simply "handed" for Jetliner installation, oil filters and drives being changed as to side. Drives are provided for units of the electro-thermal de-icing equipment.

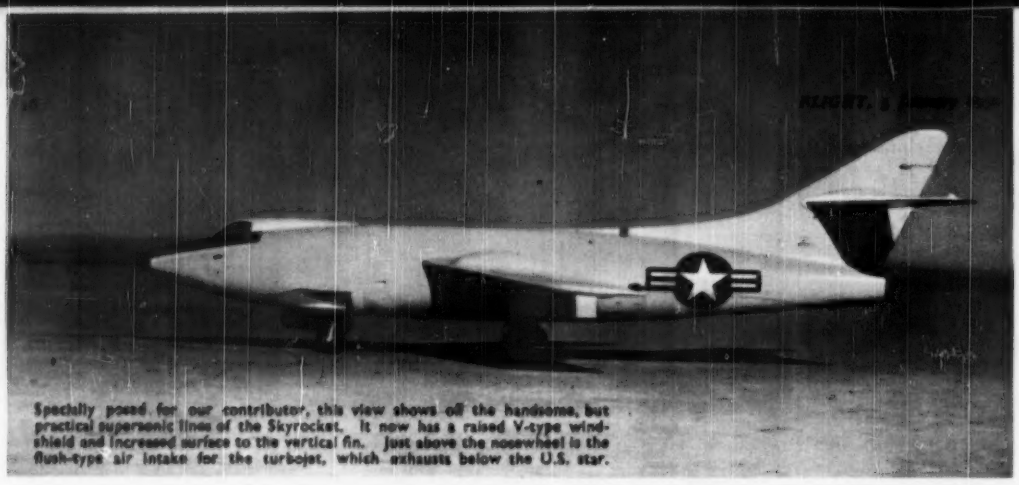
Avro Canada have been very satisfied with the service given by Derwents, and although it was intimated that there is a possibility of axial Chinooks being further developed for use in Jetliners at a much later date, the importance to a civil aircraft of engines with a background of operational experience such as that of the Derwents is fully appreciated. Moreover, it is felt that the Derwents could, and will be, further developed to give more power and better consumption figures. The later marks and developments of the larger, though strictly similar, Nene are cited as pointers. The Derwent 5s can now give up to 3,600 lb thrust for take-off without liquid injection. It is understood that about 15 per cent increase in take-off thrust can be offered by Derwents equipped for water/methanol injection. Specific cruising consumption for these turbojets is quoted as 1 lb/hr/lb thrust.

Like other clean, high-speed aircraft, the Jetliner presents some difficulty in keeping down speed on the circuit and approach; for this reason, from No. 2 aircraft onwards, the centre-section dive brakes, which extend under the fuselage, will be augmented by linked upper surfaces positioned

(*Continued on page 22*)

The four Derwents breathe well and give their full 14,000 lb combined thrust. Fair-sized cabin windows are provided for the pilots.





Specially posed for our contributor, this view shows off the handsome, but practical supersonic lines of the Skyrocket. It now has a raised V-type windshield and increased surface to the vertical fin. Just above the nosewheel is the flush-type air intake for the turbojet, which exhausts below the U.S. star.

TONIC SONICS

Reflections on American Research, with Special Reference to the Douglas Skyrocket

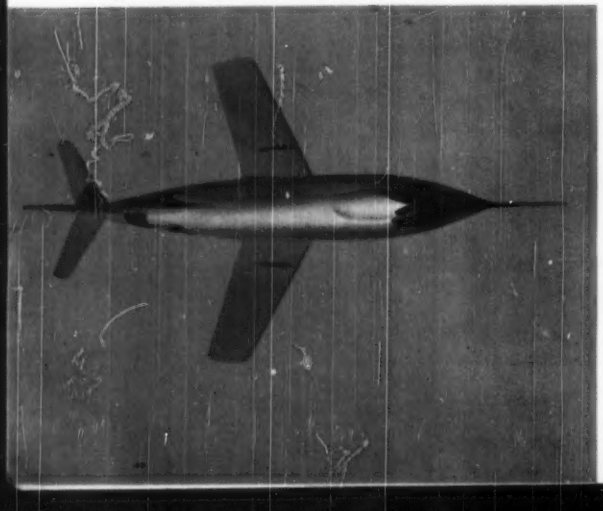
By STANLEY H. EVANS, F.R.Ae.S., A.F.I.Ae.S.

TO anyone familiar with the background pattern of aeronautical research and design, the Douglas D-558-2 Skyrocket research aircraft may be clearly seen as yet one more exemplar of the American flair for *ad hoc* research on a royal scale. It is notable as showing how the co-operative team of U.S. Navy, N.A.C.A. and Douglas (El Segundo) is beginning to pay dividends in practical supersonics. These dividends are being ploughed back into the military side of the American aircraft industry and will return like the bread cast upon the waters. But whereas the idiosyncrasies of the wandering Nile taught the Egyptians to wait for their returns, the American research seed of to-day is sprouting under the forced military draught of jet, rocket and nuclear fission. (If not so edible, modern results are certainly more uplifting!)

RESEARCH NEEDLING

This royalty in research treatment is demonstrated by the fact that as many as three Skystreak and three Skyrocket research aircraft have been built, while further evidence that the royalties therefrom will benefit the American aircraft designer may be gleaned from the statement that this part of the research haystack has already produced over 5,000 scientific reports for dissemination throughout the Military Services and the industry. This, again, is no surprise to anyone who knows the systematic and eminently sensible way in which the Americans go about searching for the needles in the haystack.

In plan view the Skyrocket lives up to its name, having the appearance of a winged missile. Note the boundary-layer fences on the wing at the inboard ends of the leading-edge slats; also the slightly greater sweepback angle of the tail for longitudinal stability.



As briefly reported in *Flight* of December 8th (and as officially acknowledged by the U.S. Navy), the Skyrocket has for some months past been breasting the transonic divide in the region of Mach unity (M = 1.0). Douglas test pilots go further and say they are now riding the hump as a matter of routine technique, with no more sensation than just a slight turbulence which smooths out again. Much of this information, we might add, has been known for some time in aeronautical circles within a 3,000-mile radius of Muroc. But, in keeping with salt-water traditions, the Navy prefers the strong and silent rôle in public relations, in contrast to the Air Force, which has learnt to whistle in a higher key. And since the taxpayer likes to hear a tune or two for his money, it is not surprising that the light blues collar more of the cash and most of the kudos.

Theoretically, of course, both Services are now supposed to be operating within the framework of a unified Defence Command and, presumably, under the same security and publicity directives, but, in practice, the difference between their respective philosophies in the sphere of public relations is very noticeable to the foreign observer. This difference is sharply marked whenever a new prototype is ready for the air. The Air Force is quick to publicize its latest offspring with all the verve and vanity of a proud and youthful parent, while the Navy, on the contrary, wraps *its* infant deeply in the bulrushes, seemingly in fear of some predatory Russian Herod on the prowl.

In all fairness to the Navy, though, we have been told they are only faithfully carrying out the official policy laid down by the late Defence Secretary Forrestal—himself an ex-Navy man. The Air Force, on the other hand, has never played strictly to the Forrestal rules, believing that it is impossible to erect a Brass Curtain much higher than the airport fence. Undoubtedly this more realistic interpretation of peace-time policy operates to the benefit of the light blue team; so much so that the Navy is now beginning to draw aside its end of the curtain a bit more. This was clearly shown during the recent B-36 Congressional investigation, when the Navy claimed to have developed a batch of jet fighters in advance of current Air Force types. A look under the haystack at the

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TONIC SONICS . . .

Skyrocket shows where the needle has been injected.

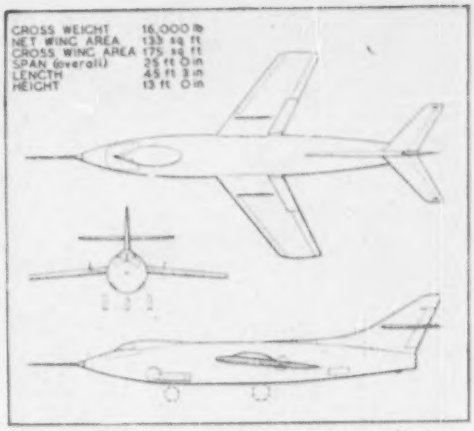
Since its first flight in February, 1948, Douglas test pilots John Martin and Gene May have put the Skyrocket through some hundred-odd test flights, ranging from sea-level to 40,000 feet. A good many of these tests have reached supersonic speed in shallow dives at fairly high altitudes, but last July, at Muroc, May is reported to have turned on the rocket heat and surged over the drag mountain at 25,000 feet in smooth level flight, reaching a Mach Number of 1.05, or roughly 730 m.p.h. Supersonic flights have since become more or less normal practice, even down to desert level, and on December 1st we had the good fortune to be the guest of the U.S. Navy to witness one of these "supersonic" runs about 50 feet off the dry lake bed at Muroc.

No official instrumentation was attempted, so any claim to have witnessed 760-plus would be pure speculation on our part. (The local Press galaxy cheerfully talked themselves into 770 m.p.h.!) But we must say that in nearly 40 years of watching aircraft on the wing, this is the first time we have fully realized the meaning or significance of the term "slipstream." One had the impression that the Skyrocket was skating on the airstream, instead of bruising and battering the unhappy air particles out of the way. Perhaps the fact that the sonic "whoosh" came up well behind the aircraft had a lot to do with it.

SIGN POINTERS

Design Backdrop.—Merely a cursory glance at the swept-wing Skyrocket shows it to be a big technical advance over its predecessor, the straight-wing Skystreak. The latter design was well under way before the aerodynamic significance of wing obliquity was properly assessed, either in America or Britain. After VE-Day, however, and the subsequent (and enlightening) combing of the Teutonic haystack, it became clear that an oblique wing plan-form was a highly useful means of retarding the compressibility drag rise which begins in the foothills of the transonic divide—and hence it could be used to increase the upper speed limit with currently available power units.

It is noticeable, in fact, that a subtle change in high-speed design concept took place after the penetration of American technical Intelligence beyond the Rhine. One cannot help noting, for instance, a certain external similarity between the post-war Skyrocket and the Messerschmitt P-1110 swept-wing jet fighter design, probably conceived as early as 1944. Which is not to imply that the Douglas, El Segundo, design team came back from Germany inspired to copy the final crop of German wartime jet designs. It might be nearer the truth to say that they knew a good thing when they saw it and were quick to sense where the German high-speed research could be used to fill in many of their own gaps in the transonic range.


GROSS WEIGHT 16,000 lb
NET WING AREA 133 sq ft
GROSS WING AREA 175 sq ft
SPAN (overall) 25 ft 0 in
LENGTH 45 ft 3 in
HEIGHT 13 ft 0 in

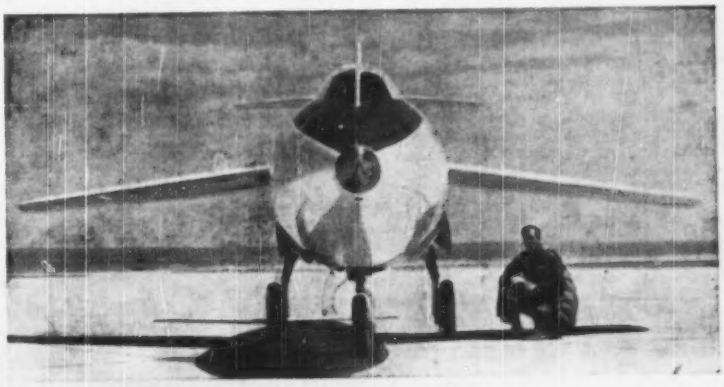
Douglas D-558-2 Skyrocket: General arrangement drawings.

By thus cleverly adapting the oblique wing to their own school of research and design, they have remained not merely abreast of the art, but actually a step in front of it.

Authorized under the D-558 series of the national joint research programme, the jet-cum rocket-engined Skyrocket is the second full-scale prototype designed and built by Douglas, El Segundo. In passing, it might be recalled that its forerunner, the Douglas D558-I Skystreak, was powered only by turbo-jet and originally specified for obtaining flight research data in the high sub-sonic zone up to a Mach Number of 0.85. Structurally, however, the Skystreak was actually designed for an M of 1.0 and although the turbojet power alone (Allison J-35 rated at 4,000 lb s.t.) was insufficient to climb the drag rise to Mach unity, it did come close to achieving that value in diving flight.

Power Plant.—The Skyrocket carries on into the supersonic zone, boosted over the Mach mountain by a Reaction Motors four-barrelled rocket engine delivering a total thrust of 6,000 lb at a chamber operating pressure of 230 lb/sq in. Some 3,000 lb weight of liquid oxygen and alcohol propellant is shot off in about 1¼ minutes to obtain this thrust, but if the chambers are fired separately, this time can be extended to about four minutes. (The rocket-engine throttle comprises a four-stepped lever for this purpose—the pilot can either go straight through or fire each at intervals.) Rocket fuel is pumped with a hydrogen-peroxide pump similar to the one employed in the German V-2 rocket bomb.

Power for normal flight and normal take-off is provided by a Westinghouse J-34 axial-compressor turbojet, which has a nominal static thrust rating of only 3,000 lb. Fuel



This head-on view emphasizes the short span (25ft) and the "hobble-skirt" landing gear retracting straight back into the fuselage. Alongside is John Martin, Douglas chief test pilot, who was the first to fly the Skyrocket.

The four barrels of the rocket motor offer 6,000 lb of extra thrust. Murocketeer Gene May, Douglas test pilot (seen here), is making a routine practice of riding the transonic hump at Muroc from desert level to 40,000ft.

TONIC SONICS . . .

tankage for the jet unit is only 250 U.S. gallons of ordinary aviation gasoline (not kerosene), and so the overall endurance is limited to about 25 minutes. Incidentally, one of the penalties of the high-compression axial-flow J-34 seems to be a fairly high drop-off in thrust at high speed, a fact which makes the supersonic performance of the airframe all the more remarkable.

To boost the take-off on the turbojet unit, and thus conserve the jet fuel and the net time for altitude test runs with both jet and rockets operating, provision has also been made for carrying a pair of 1,000-lb jettisonable Jato bottles on the fuselage sides. These were not fitted at the time of our visit, since the main purpose of the demonstration was to show off the low-level supersonics, but nevertheless there must be many occasions when the extra 2,000 lb Jato kick is worth having up the pilot's sleeve, so to speak. Fully loaded, the Skyrocket grosses around 16,000 lb, which means that on the net wing area of 133 sq ft, the wing loading is 120 lb/sq ft.

In the arrangement of the power plants and fuel systems, extreme care has been taken to distribute all the fuel uniformly about the aircraft c.g., in order to reduce the trim changes during consumption of the fuel. Exhaust outlets also are arranged so that the thrust reacts through the c.g., thereby eliminating the effect of offset thrust moments on the aircraft trim. (With the high jet powers now available, this factor can have a powerful effect on stability.) Apropos which, it will be noted that the rocket battery discharges from what normally would be the tailpipe nozzle at the fuselage extremity, while the turbojet exhausts through an elliptically shaped ventral opening in the after part of the fuselage belly.

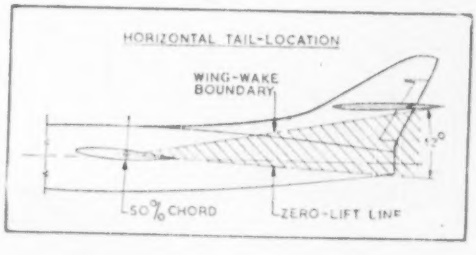
Wing Transonics.—Apart from the tell-tale sweepback, there is nothing particularly supersonic-looking about the wing; the profile, for instance, is patterned along high-speed, sub-sonic lines, with rounded leading edge, well-aft maximum ordinate and reflexed trailing-edge contours; moreover, the thickness/chord ratio is only moderately thin—approximately 9 per cent, we should say, from optical inspection. The reason, of course, is that the design objective behind the Skyrocket was a research aircraft capable of the highest possible level speed without sacrifice of relatively normal low-speed characteristics, and the eminently successful fulfilment of this broad-ranging specification is precisely why this aircraft is such a significant contribution to the design art.

The sweep angle, measured along the quarter-chord axis of the wing, is the standard N.A.C.A. configuration of 35 deg, while in front elevation the droop anhedral of 5 deg is quite noticeable. This negative geometric dihedral has been found necessary in order to reduce the excessive "dihedral effect" of the sweepback at low speed and high-wing incidence, an effect which is known to cause the so-called "Dutch-roll" instability—a form of lateral oscillation akin to the snaking motions (roll-plus-yaw) of a Dutch skater.

Longitudinal Control.—For adequate longitudinal control at high Mach Number, the tail-sweep angle is 40 deg, the extra 5 deg over the wing having the effect of placing the tail on a higher rung of the Mach ladder—with a bit in hand, as it were. (The thinner section of the tail would also contribute another rung.) One other noticeable feature of the horizontal-tail design is the large angular change provided on the stabilizer portion, in order to accommodate the large changes of longitudinal trim throughout the transonic zone. This trim adjustment is performed through movement of the rear spar at a fairly rapid rate by electric motor. Changing the stabilizer setting instead of the elevator angle is obviously a more effective tail-trimming device, since it alters the pressure distribution over the entire tail surface, rather than the local pressure over the elevator. And so, by an odd design quirk, we return to the standard practice of well over 30 years ago!

A nice blend of science and art is clearly evident in the tail ensemble, particularly in the treatment of the vertical surface, which escapes that depressing linear angularity so often seen. In this regard, although the Skyrocket tail displays a geometric similarity to that of the Messerschmitt P-1110 previously mentioned, it has gone one better, in that the horizontal tail is mounted higher and, consequently, the rudder is vastly more effective throughout the whole speed range. It should be obvious by this time (but, oddly enough, is *not*, if you take a look round at the current scene) that, in order to avoid buffeting of the tail surface, the latter must be mounted high enough to clear the wing wake at high Mach Numbers. A satisfactory relationship recommended by Douglas is to locate the horizontal tail at least 13 deg clear of the zero lift line of the wing, as seen in the accompanying sketch.

Because of the vulnerability of this Achillean heel in



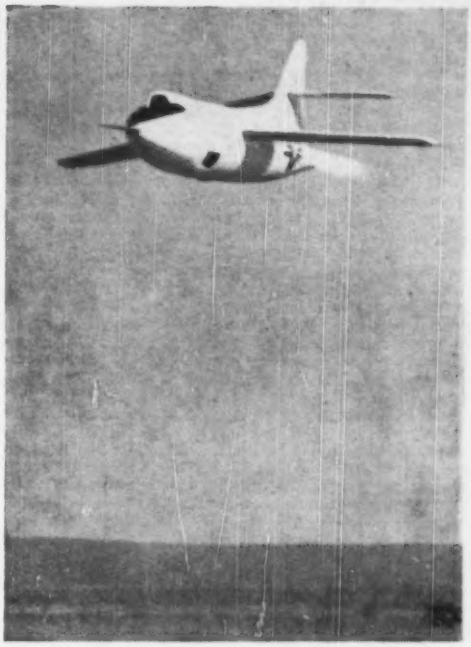
modern high-speed design, the Gremlin rough-riders are now beginning to show their hand. Only a few months ago, at the 1949 National Air Races, a North American F-86 Sabre took a sound rattling of its whole tail end, resulting in wrinkling of the fuselage skin and the loss of more than half of the elevators. The pilot, indeed, was fortunate in having sufficient stabilizer trim control in hand to make a spectacular landing. No doubt, a temporary solution will be found in beefing-up the tail structure, but the basic treatment must eventually be aerodynamic prevention, rather than structural half-cures. (So long as the bold, bad Gremlins are encouraged to ride the tail, they will try to pop the rivets.)

Somewhat surprising to the advocates of power-operated control systems for jet fighters is the fact that all the control surfaces of the Skyrocket are manually operated through straightforward, low-friction, control circuits; furthermore, none of them has any form of aerodynamic balance—a design characteristic made feasible, no doubt, by virtue of the narrow-chord movable surfaces. It is interesting to note, for example, that the rudder and elevators are simple hinged surfaces provided only with anti-flutter mass-balance weights at their extremities.

Lateral Control.—In the case of the ailerons (invariably the trickiest control to get right), mass, or dynamic, balancing is combined with static balancing in the form of a continuous nose-portion forward of the hinge axis and shielded within the wing profile—the dynamic mass requirement being met by a series of tungsten balance-weights distributed along the leading edge of the aileron. With this simple construction—a return to pre-war subsonics, in fact—both the upper and lower surfaces of the aileron remain cleanly mated with the wing surface throughout the aileron travel. This feature contributes to a very respectable drag-saving at high speed.

Dimensionally, the ailerons extend over roughly 45 per cent of the semi-span of the wing, while their mean chord is only about 15 per cent of the local wing chord—a very low chord-ratio. Based on a total aileron area of 10 sq ft and the net wing area of 133 sq ft, the area ratio (aileron/wing) is 0.075. If, however, the gross wing area of 175 sq ft is considered more appropriate (a doubtful premise, in the case of low- and mid-wing configurations), then the area ratio comes down to 0.057. Recent statistical data on this point indicate that fighters usually average around 0.060, so obviously the Skyrocket is not shy on aileron area, despite the optical illusion produced by the low-chord effect.

Although this type of aileron, *per se*, is known to possess undesirable yawing moment characteristics at high wing angles near the stall, the answer to that, in the case under review, is provided by two powerful remedial factors; namely, the installation of Handley-Page-type leading-edge slats over the outer 75 per cent of the wing span, plus a highly efficient vertical tail ensemble. The open slot combs out the burbling air and holds up the rolling moment to higher wing angles, while the combination of sweeping dorsal fin and powerful rudder counteracts the opposing yaw of the down aileron. All of which, of course, is elementary aerodynamics—for those who know where to burrow under the haystack.



A supersonic speed run near desert level at Muroc with turbo-jet and rocket motor in combined operation.

Design artist: Mr. Edward H. Heinemann, chief engineer of the Douglas El Segundo plant, takes a look at his handsome offspring. (Wing slottery by courtesy of Sir Frederick Handley Page!) This view shows the original model with flush-type windshield, previously illustrated in *Flight* of February 5th, 1948.

Mounted on four sliding links from the wing, the slat aerofoil is of the floating type, automatically opened or closed by the air pressure over it. (The resultant pressure vector over the leading edge changes direction, magnitude and sense, with changing wing incidence and speed.) Port and starboard slats are mechanically interconnected so that they operate in unison together, and they can be locked in either the open or closed position. Chordwise flat-plate segments, which act as boundary-layer fences, are mounted on the upper surface of the wing at the inboard end of the slats, model research indicating that they boost the efficacy of the slot action as an anti-tip-stalling device over back-swept wings.

While the slat element is very neatly tailored to the wing in the closed position, nevertheless there is a slight, but perceptible, discontinuity where the chamfered trailing edge of the slat nests on to the wing profile, as it is hardly practicable to taper-off the plate thickness to a razor-edge finish. In view of the extreme sensitivity of a laminar-flow wing section, particularly in the region of the leading edge, it would be interesting to know whether, in practice, the Skyrocket wing does actually achieve laminar flow over the slatted portion of the wing. Experience suggests that the transition locus would lie along the trailing edge of the slat (about 13 per cent chord), and hence the profile drag is probably at least double that of the laboratory ideal. Perhaps in view of current fabrication and design techniques, this point is somewhat academic at the moment.

TONIC SONICS . . .

but it does signpost where further dividends are possible.

In mid-I contrast, so to speak, the smooth surface continuity already noted between the wing and ailerons is exhibited to an even higher degree in the case of the trailing-edge flaps, which are plain hinged surfaces extending over about 42 per cent of the net wing span and having a mean chord length about 20 per cent of the local wing-chord. One of the many penalties of sweepback comes into play here, as the lift increment of the flaps drops off nearly 50 per cent for a sweepback of 35 deg. The braking drag, however, is still useful for ground-run deceleration. In the air, this function is performed by retractable plate-type flaps hinged low down on the fuselage sides well behind the wing.

Fuselage Features.—Characteristic of recent jet breeding is the large size of the fuselage, for no longer can the frontal area be strictly tailored to the size of the engine or the pilot; rather has it now become the main function of the body to streamline the fuel tank. Because the wings are too thin and the combined jet-plus-rocket fuel tankage considerable, the Skyrocket fuselage must needs be big in diameter, as well as long; namely, 5ft and 41.7ft respectively, giving a fineness ratio of 8.33. All three wheels of the landing gear also retract into the fuselage, the main wheels being designed to fold straight back into the midriff section just aft the wing attachments. (Incidentally, the narrow-track landing gear is about the only feature of the Skyrocket that strikes us as impracticable for projecting into future jet-fighter design. The most practical solution would appear to be the bicycle tandem gear with small outrigger wheels at the wing tips.)

Reference back to an earlier description of the Skyrocket (*Flight*, February 5th, 1948) shows that the cockpit canopy was originally flush with the fuselage nose lines, but one is not surprised to note that this aerodynamic ideal has now been superseded by a raised, acute-vee-type windshield and canopy fairing. The flush-type canopy is excellent wind-tunnel aerodynamics, but it must await the prone-pilot cockpit layout—possibly the next signpost along the high-speed highway. All the same, the present windshield design is an elegant-looking compromise between adequate vision and smooth airflow. The designer, in fact, has succeeded in being kind to the pilot without hurting the feelings of the air particles.

Mention has also been made in this earlier description to the research instrumentation and cockpit air-conditioning systems, and the unique method of jettisoning the nose portion of the fuselage, complete with cockpit, by means of explosive-charged structural connections. Through the use of thick magnesium-alloy skinning, the fuselage surface is velvet smooth and it is quite difficult to detect this jettison parting line located immediately to the rear of the pilot's seat. We are assured, however, by our Douglas friends that the "sweet sorrow" of parting has been well rehearsed in ground tests.

One other notable design feature is the low-drag, high-ram-pressure type of aspiration adopted for the turbojet unit, the air intakes of which are located on the fuselage sides, low down and well back from the long tenuirostral* nose. In principle, this form of submerged inlet is really a flush scoop let into the fuselage skin, the intake air being fed down a parallel-sided grooved ramp increasing in depth as it approaches the lip of the scoop. A boundary-layer-bleed vane in the mouth of the scoop, acting on the principle of the Handley Page slot, serves to prevent turbulence in this region. The submerged air-intake not only has low aerodynamic drag, but combines the high pressure-recovery of the nose-inlet type (previously adopted on the Skystreak) with the short internal ducting of the aft-fuselage or wing leading-edge position. The Skyrocket's jet aspiration system, alone, places it well out in front as a design portent of things to come in American jet fighter design.

* *Ornithological term: "slender billed."*

TOBACCO ROAD

After being privileged to see the Skyrocket take off under normal jet power, fly smoothly through the transonic zone and land again, one senses how far Douglas and the U.S. Navy have come along the supersonic road without recourse, shall we say, to "chronic sonics" of the more unorthodox variety. Our own reaction is more a feeling of "tonic sonics" in sizing up this job, for not only has it the airmarks of a practical aircraft, but it looks a remarkably handsome one to boot. In our opinion it will stand out in aeronautical history as an engineering signpost worth reading, and it places Edward H. Heinemann, chief engineer of Douglas (El Segundo), and Leo J. Devlin, his chief assistant, among the top-ranking hierarchy of American aircraft designers. Engineering honours are also due to R. C. Donovan (project engineer), K. E. Van Every (chief aerodynamicist), and C. H. Stevenson (chief stress-analyst), for their decisive part in an outstanding achievement.

From tobacco to supersonics may seem a far cry down a long road, but there is an historical background for this practical type of applied research which has flowered in the New World. It should be of interest to the English-speaking peoples, because the first milestone on the road marked a research pattern set by the first English colonists of the Virginia Company, and followed pretty consistently in American science for the past three hundred years or more. It began with the culture and curing of tobacco, which set the Colony of Virginia on its economic feet, the hard fact being that applied science—admittedly embryonic in those days—had perforce to take priority over fundamental first principles (or pure science), then blossoming under the more leisurely culture of Europe.

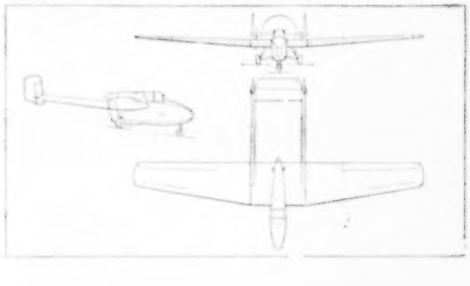
The essential difference in attitude between the science of the Old World and the New is that John Rolfe in Virginia cultivated *Nicotiana Tabacum* as a commercial product, whereas Isaac Newton was searching only for the scientific truth behind the falling apple. We need not quibble over the relative merits of an Edison *vis-à-vis* a Faraday or a Helmholtz, for they are opposite ends of the same tree, but the *ad hoc* pattern (the leafy end) is still discernible in America to this day. It can be seen again in the Skyrocket, nurtured in the atmosphere of applied science. Perhaps the narcotic stimulation of an Indian weed found in Virginia can be said to have started the kind of pipe-dream that eventually moved the Mach mountain.

A POLISH ULTRA-LIGHT PUSHER

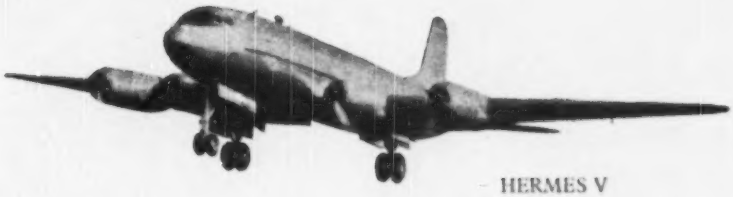
NOW flying in Poland is the prototype of the winning design in that country's 1947 national contest for ultra-light powered gliders. Designed by T. Chylinski, it is an all-wood pusher of 860 lb all-up weight named the Pegaz.

A mid-wing, twin-boom layout is employed, and the Pegaz has a nosewheel undercarriage and enclosed cockpit hood. The home-produced Gad flat-four, two-stroke engine produces 30 h.p. and is said to give a maximum speed of 85 m.p.h. Dimensions of the Pegaz are: span, 38ft 8in; length, 23ft; height, 5ft 3in.

It is considered possible that the Pegaz will be produced in one of the State factories for the Polish flying schools. So far as is known, however, the standard trainer for all the schools, which are State-controlled, will be the two-seat Junak, which has a 125 h.p. Russian M-11 radial engine.



HASTINGS



HERMES V

HERMES IV

MARATHON II

MARATHON I

HANDLEY PAGE has in full-scale production the Hermes IV mainliner for B.O.A.C.'s Commonwealth routes, the versatile Hastings transport which is in service with the R.A.F., and the Marathon I feeder-airliner for various overseas operators.

Jet versions of the Hermes and Marathon are, respectively, the world's biggest and smallest civil transports powered by turbo-propellers.

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REPAYMENT of a DEBT

A Suggestion on the Subject of Expressing Gratitude

By AIR VICE-MARSHAL SIR JOHN W. CORDINGLEY, K.C.B., C.B.E., R.A.F. (Ret.)

"FLY British and fly safe" is advice which air travellers have learned from experience to trust. It is also a promise, the fulfilment of which is very largely due to the fact that a great majority of civil aircrews were trained in the inexorable school of the R.A.F. Peace-time and war-time flying have this in common: mistakes must not occur.

In the early days of the railways many passengers, including Queen Victoria herself, were in the habit of pausing to thank the engine-driver for a safe deliverance from the perils of the iron way. Although this custom has fallen into disuse, airline passengers would often like to give tangible expression to their gratitude for the matchless efficiency of the crew who bring them down in safety at journey's end. The problem is—how? One possible solution, I suggest, lies in the R.A.F. Benevolent Fund.

It is to help any such airmen who have struck hard times, or who are in any way in need, that the R.A.F. Benevolent Fund exists. Founded by Lord Trenchard in 1919, the Fund is empowered to help serving and past members, men and women, of the Royal Air Forces and their dependents in need.

The crews of airliners will be happy to know that through the generosity of their passengers war-time comrades who have fallen on evil days will be helped back to security. In 1948, the Fund spent £668,656 on all forms of assistance or, since its inception, £3 millions—record sums.

The Fund helps in many ways. It gives or lends money to disabled personnel keen on setting themselves up in business after being demobilized. Those who receive loans are expected to repay the principal when the business prospers. It assists in the training of those whose education was interrupted by war service. When sickness brings expense beyond the patients' means, the Fund pays, or helps to pay, the bill, and often provides also for the essential period of convalescence after hospital. Recently, for example, the ailing wife of an L.A.C. was sent to Switzerland so that her life might be saved. Prams, cots, clothing, boots, deaf-aids and artificial limbs—all these are among articles which the Fund helps to provide. It also helps to pay pressing debts and redeem pawned articles.

A major function of the R.A.F. Benevolent Fund is education. In addition to helping with the education of the children of deceased officers and airmen, the Fund itself maintains two residential schools. These are known as the Alexander Duckham Memorial Schools, and provide the sons of deceased airmen with a residential home in a healthy environment, and eventually with a start in life. The boys attend leading day-schools in the locality when they reach school age.

In 1948, the R.A.F. Benevolent Fund spent £67,336 on education, including the two above-mentioned schools. This money went principally towards educating the children of personnel killed during the war, or during service. The policy of the Fund is to give these children an education of the same standard as that which they would have received had their fathers lived. In many cases the lack of a father makes it advisable to send the child to a boarding school, for which the State still makes little provision.

The heavy R.A.F. casualties during the war are responsible for the fact that the educational help provided by the Benevolent Fund is on such a large scale. Many of the children whose fathers were killed during the war years are only now reaching school age. It is anticipated that the calls upon the Fund for this type of help will reach their peak between 1959 and 1966.

To carry out all these responsibilities the R.A.F. Benevolent Fund relies not only upon those within the Service but also upon help from outside sources. Incidentally, eligibility for assistance from the Fund depends solely upon past or present membership of the R.A.F. and W.R.A.F.—and, of course, upon the merits of each individual case. When considering applications the Fund never asks whether the applicant is a subscriber or not.

President of the Fund is H.R.H. the Duchess of Kent and the chairman is Lord Riverdale, who succeeded the late Duke of Kent in that office in 1942. Headquarters of the Fund are at 67, Portland Place, London, W.1. (Langham 8343.)

AIR SPORT FOR 1950

OUTSTANDING in the aviation sporting calendar for 1950, issued by the Royal Aero Club, are the seven events comprising the National Air Races, which, as forecast in *Flight* of November 17th, are not to be flown this year at a single meeting, but will take place mainly as individual events at different venues. The calendar now reveals the allocation of the seven races to five clubs.

One fixture which could hardly be classed as "sporting" appears in the list—the Brussels Show from June 10th to 25th. The calendar (which is provisional) is as follows:—

Mar. 8.	R.Ae.C.: Ball, Londonderry House.
May 27-June 4.	F.A.I.: General Conference, Stockholm.
May 28-29.	Bembridge and Sandown Aero Club: Rally.
June 3-4.	Ultra Light Aircraft Association: Rally.
June 10.	Darlington Flying Display.
June 10.	Yorkshire Aeroplane Club: International Rally, Sherburn-in-Elmet, Leeds.
June 10-25.	Brussels International Aeronautical Exhibition.
June 15-18.	Benelux Air Tour.
June 17.	Wolverhampton Aero Club: King's Cup Race.
June 17-18.	Normandy Rally.
June 24-26.	Le Touquet Rally.
July 1-3.	R.Ae.C.: Members' Deauville Rally.
July 2-9.	Aero Club of Italy: International Air Week.
July 3-16.	Aero Club of Sweden: International Gliding Contests, Orebro.
July 15.	Newcastle-upon-Tyne Aero Club: Norton Griffiths Trophy Race and Grosvenor Cup Race (both International), Woolsington.
July 22.	Yorkshire Aeroplane Club: International S.B.A.C. and Air League Cup Races, Sherburn-in-Elmet, Leeds.
Aug. 19.	Swansea and District Flying Club: Kamsley Trophy Race (International), Fairwood Common, Swansea.
Sept. 2.	Coventry Aero Club: Siddeley Challenge Trophy Race, Baginton, Coventry.

SMART TURN-OUT: In spite of the fact that their tender and ambulance are on duty whenever flying is taking place at Brockworth or Moreton Valence, the Gloster Aircraft Company's fire service have entered numerous brigade competitions and consistently won trophies, even in the face of formidable opposition by teams from the London and leading provincial fire brigades. In the centre of the group above is their chief officer, Mr. F. W. Chandler. The brigade has now acquired one of the latest Pyrene crash tenders.

CANADIAN CONTENDER . . .

(Continued from page 15 in photogravure section)

between the jet pipes. The simple landing flaps on the prototype will also be replaced by double, slotted flaps at a later date.

Another improvement in mind is the incorporation of the cabin air-intakes in the long lead-in wing fillets. This would eliminate the prominent ventral scoop now fitted. Designed for operation at 30,000ft, the cabin is pressurized to a differential of 8 lb/sq in, and thus to give 4,000-ft conditions at altitude. An automatic regulator has been designed to maintain sea-level conditions to 21,500ft.

Reference has already been made to the elimination of the servo rudder, made possible by the unexpectedly good asymmetric control and effectiveness of the primary surface. The thrust line of the jets is not only near the aircraft centre line, but also acts approximately through the c.g., and thus there is little fore-and-aft trim change with alteration of power. It is understood that the servo elevators will be retained to look after extreme c.g. positions.

Each outer wing carries two fuel tanks, giving a total capacity of 2,300 Imp. gallons. It was indicated that, if necessary, space could be found for almost as much fuel again in the wing centre-section and remaining outer-wing space. In the cockpit is to be seen a further example of the functional diagram incorporated in the fuel cock layout. This idea is gaining in popularity. According to the position of the fuel cocks, the feed lines and direction of flow from tank to turbojet are indicated on the diagram. Any tank can be cross-fed to any turbine. It is usual to start-up on the inboard tanks.

Electro-thermal Deicing

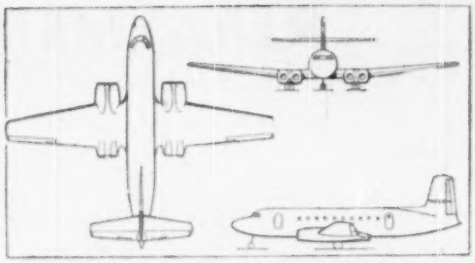
Deicing problems have naturally demanded close attention in Canada, and Avro's are putting the aircraft through a really rugged weather-test schedule. Wing and tail surfaces carry electro-thermal deicing strips, of which very good reports have been received. Power consumption is rather high, but only a thin strip at the nose of the rubber leading-edge is supplied continuously, the upper and lower portions alternating in their demands. The theory is that, having split the ice-cap which forms, the air stream will get under the edges and peel the two sections off. Unlike some rubber boots, this smooth, flush-fitting strip (into which are moulded the three sections of the element) gives an excellent surface-finish both from the aerodynamic point of view and that of preventing erosion.

No attempt has been made to trim or furnish the cabin to date, but it is sound-proofed, and reports from the crew indicate a very low noise level, except perhaps at the very end behind the jet outlets. From where the port-side rear door will be placed (the prototype does not have one) the noise increases rearwards, and at the rear wall is described as being like a "ball of noise"—in other words, it is localized. It is not excessive and does not spread forward, particularly if a partition is fitted, and several ideas are in mind for eliminating it altogether.

In the cockpit all is silent, and the two R/T. roof speakers originally placed in the prototype (in place of headsets) have now given way to one speaker and a volume control. The cockpit itself is spacious and seems well arranged. View forward is well up to standard, but there is no provision for looking rearward. A crew of three is specified—two pilots and a radio-operator/navigator. On several internal routes, and with the equipment in mind for it, a crew of two will probably be considered sufficient.

AVRO CANADA C.102 JETLINER DATA
(Four 3,500 lb thrust Rolls-Royce Derwent 5 turbojets)

Span	98ft 1in
Overall length	82ft 9in
Wing area (gross)	1,157 sq ft
Wheel track (mean)	22ft 6in
Wing loading	51.86 lb/sq ft
Aspect ratio	8.31
Take-off weight	60,000 lb
Landing weight (max.)	52,500 lb
Payload	12,700 lb
Fuel weight	18,330 lb
Max speed at 30,000ft	Over 500 m.p.h.
Cruising speed	450 m.p.h.



Three-view general arrangement drawing of the Avro Jetliner.

Experience with the existing nosewheel steering control—a small, self-centring wheel—has indicated that it should be brought nearer to the captain's left hand. This is being done. The angle of the nosewheel is marked on the control and hydraulic power is used with electric actuation.

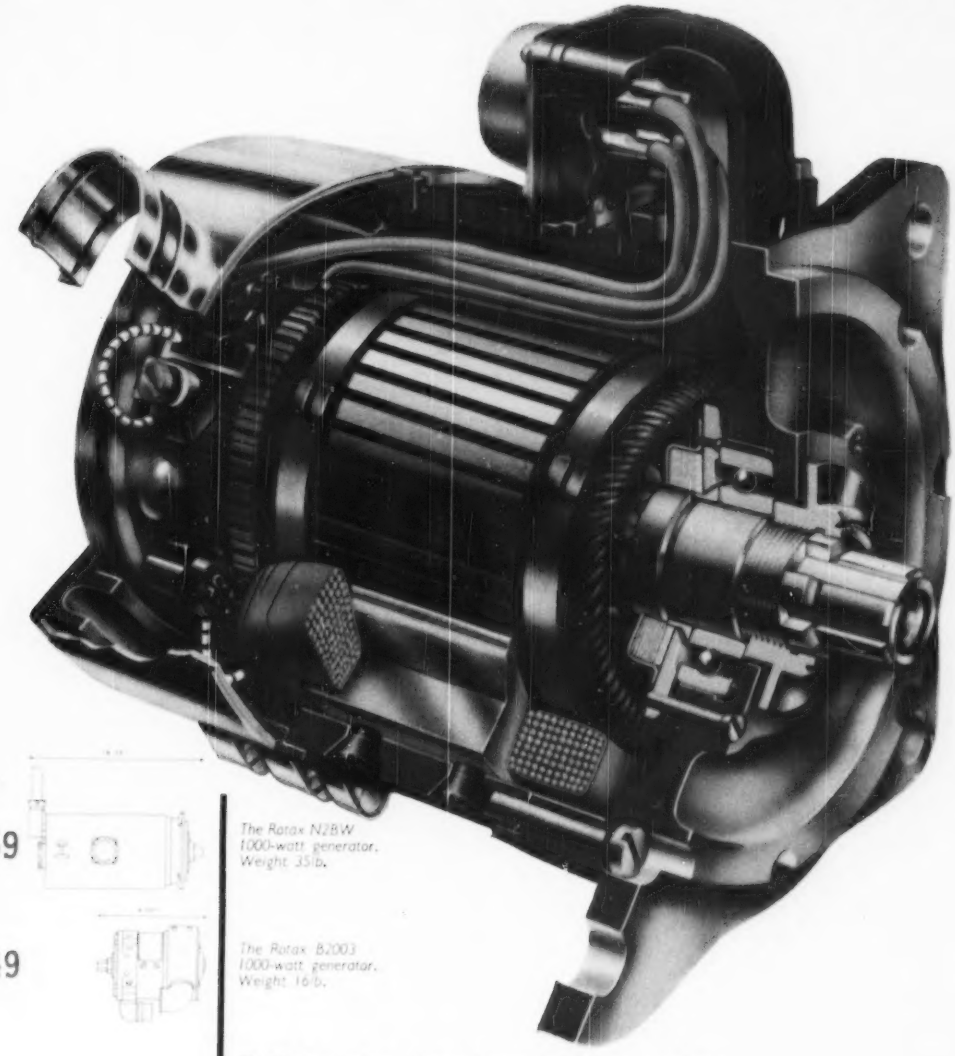
On the main control spectacle are finger controls for the elevator trimmer and the servo-elevator surface.

Regarding the flying and performance of the Jetliner, both Jimmy Orrell and Don Rogers have spoken well of the simplicity of handling, good asymmetric control and the aircraft's ability to meet designed figures. Some misleading reports about its climb appeared in certain papers some few weeks ago, arising from a mild shoot-up at Malton. It was said then that the Jetliner could climb at 6,000 ft/min; "zoom", however, was the word required. The maximum climb figure with representative load and normally-rated Derwents is probably 2,000-2,500 ft/min. This is quite adequate for the type.

With 200 r.p.m. in hand on the turbojets, a T.A.S. of 460 m.p.h. at altitude had been achieved up to the time of the aircraft's first full check-over. Take-off comparisons with airliners of comparable weight operating from Malton have proved interesting, and the small space required by the C.102 is reported to have surprised everyone. A figure of 1,700ft for the take-off run on a hot day (96 deg F) and with representative load and unstated wind, has been quoted to give an indication of capabilities. A landing run of less than 1,000ft is also reliably reported. By the time the aircraft is ready for operation the a.u.w. (at present 60,000 lb) will probably be about 62,500 lb. Payload should have increased for some ways of saving structure weight have already been discovered.

Approach and landing characteristics are reported to be very good, as is the stall power on or off. In this connection low power-plant weight (or high expendable fuel-load *versus* high power-plant weight) are considered to be extremely important by the makers. By comparison with a piston-engined aircraft of comparable power, the landing weight at the end of a flight is probably as much as 6,000-8,000 lb lower. A low wing-loading for landing must, it is felt, mean added safety. Much has yet to be learned about the Jetliner's economics, but rapid and promising progress is being made. Australia, Canada, the West Indies, have all been mentioned as suitable areas for its introduction and the makers have been quoted as favouring Australia because of the good weather and low traffic densities. As with any pure-jet aircraft, the fuel reserves for holding constitute a serious problem.

In Canada the Jetliner and Comet are said to be complementary to each other, the one handling shorter ranges, the other the longer, so the passengers may make journeys involving a trans-continental or ocean stage, followed by an inter-city stage, entirely by jet aircraft. Devaluation will have made a considerable difference to the cost of the Derwents and thus to sales prospects and in their modern plant at Malton, near Toronto, Avros have prepared to build Jetliners in quantity. They give full acknowledgment for the use of the knowledge and long experience of the other members of the Hawker Siddeley Group in England, and also for the production know-how drawn from American aircraft companies.



1939

The Rotax N2BW 1000-watt generator. Weight 35lb.

1949

The Rotax B2003 1000-watt generator. Weight 16lb.

Half the size—less than half the weight

—but the same output

The problem of more power with less weight in a smaller space faces all aircraft designers ; this lighter, more compact Rotax generator is one of the answers. It is typical of the continual progress that is being made in every branch of Rotax engineering and research—a progress which contributes to the success of the world's most advanced aircraft.

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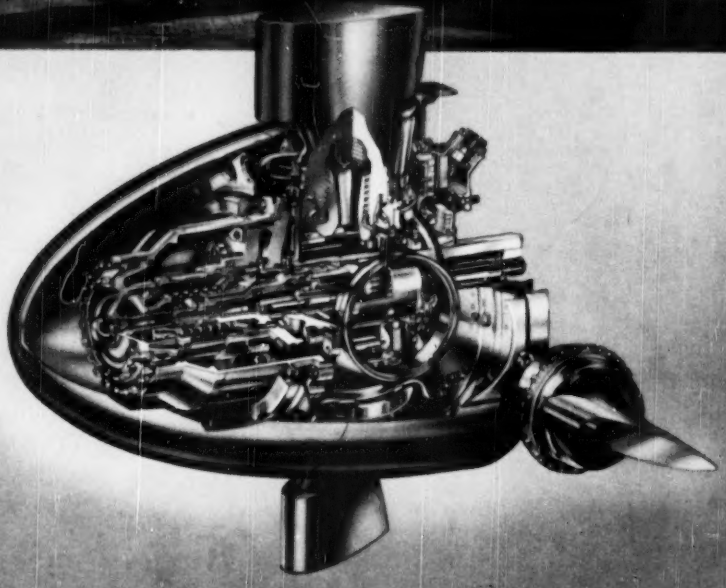

Rotol Propellers are on the Vickers "Viscount"—the World's first Turbine Propeller Powered Airliner to fly and the first of its type to be granted a British Normal Category Certificate of Airworthiness.

ROTOL

GLOUCESTER • ENGLAND

NEW YEAR HONOURS

Recognition of Services in the Berlin Air Lift

DISTINGUISHED services in the Berlin Air Lift are recognized in the New Year Honours lists, issued last Monday morning. The majority of such services by pilots and others, are marked by the award of M.B.E.s in the civil list. In addition, nine civilian participants in the Air Lift receive the King's Commendation. Below are the names, available at the time of going to press, of recipients of honours:—

BARON

John Wilmot, M.P., Minister of Supply, 1945-1947.

ORDER OF THE BATH

Companions (Civil)

G. H. Fretwell, Director-General of Works, Air Ministry; A. J. Newling, Under-Secretary, Ministry of Defence; S. Scott-Hall, Director-General of Technical Development (Air), Ministry of Supply; S. S. Wilson, Under-Secretary, Ministry of Supply.

Knight Commander (Military)

Air Marshal Sir A. Coryton; Air Marshal Sir H. W. Lumsden Saunders.

Companions (Military)

A.V-M.s D. V. Carnegie, E. J. Kingston McCloughry, T. C. St. C. Morton, C. B. R. Pelly, C. B. S. Spackman; Actg. A.V-M. L. J. V. Bates; A. Cdre. J. F. Titmas; G/C. J. O. W. Oliver.

ORDER OF ST. MICHAEL AND ST. GEORGE

Companion (Civil)

Major J. R. McCrindle, member of Board of B.O.A.C.

ORDER OF THE BRITISH EMPIRE

Knight Commander (Civil)

Frederick Brundrett, chief of the R.N. Scientific Service.

Commanders (Civil)

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Military Aircraft of the World

FLIGHT for January 26th next will be a greatly enlarged and specially illustrated number discussing the requirements, design, performance and use of military aircraft of all countries.

Early orders should be placed with newsagents for this important issue.

L'Aviation Militaire dans le Monde

LE numéro de FLIGHT du 26 Janvier prochain sera une édition beaucoup plus importante et spécialement illustré, dans lequel seront traités objectivement les sujets intéressant les qualités requises, constructions, performance et l'utilisation des avions militaires de tous les pays.

Pour recevoir cette importante édition, placez votre ordre dès maintenant à votre agent de journeaux.

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LA tirada de FLIGHT correspondiente al 26 Enero próximo estará constituida por un número considerablemente aumentado y especialmente ilustrado, en el que se discutirán las necesidades, construcciones, ejecución y uso de los distintos aviones militares de todos los paises.

Para conseguir este importante edición, hay que pasar pronto pedido al agente de periódicos.

B.O.A.C.'s Higher Organization

The Status of Engineering Executives

IT will be recalled that in *Flight* of December 15th there appeared an article under the title "B.O.A.C.'s Maintenance Organization" in which the author—an engineer who has been responsibly engaged in airline maintenance work for many years—deplored the fact that the higher organization of B.O.A.C. does not include a Chief Engineer who is head of the Engineering Department.

While there is a Chief Engineer (Operations), he said, this official is responsible to the Operations Director and through him to one of the Deputy Chairmen.

It was the writer's contention that the psychological effect of this absence of nominated and clear-cut leadership in such a vital department of the Maintenance Section would ultimately result only in impaired efficiency.

Other statements were made which might be taken as a reflection upon the integrity of certain of the Corporation's senior executives. We cannot, on reflection, subscribe to the statements expressed and can only assume that the correspondent was carried away by his strong feelings and convictions as an engineer. Having regard to the achievements of these executives in extremely important individual roles (as recorded in these columns during past months) it is clear that the statements could not be fairly applied to them.

In fairness it is therefore incumbent upon this journal to dissociate itself from the statements contained in the article, and it is regretted that *Flight* should have been the instrument through which they were advanced.

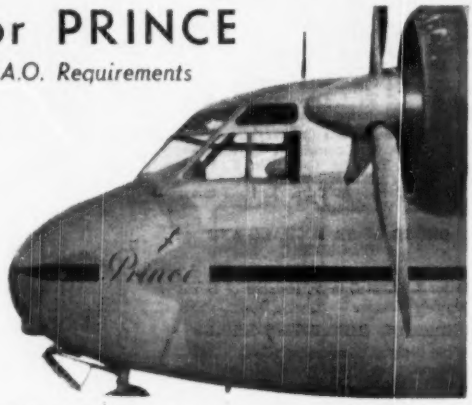
C. of A. for PRINCE

Percival Feederliner Meets I.C.A.O. Requirements

RECOGNITION of the vigour with which Percival Aircraft, Ltd., have pursued development of the Prince feederliner is made by the announcement that the type has been awarded the first normal-category Certificate of Airworthiness under the current A.R.B. system of certification. The Prince therefore complies with the latest I.C.A.O. transport-category "A" requirements, except in a few minor respects which are now the subject of appropriate action. It is the first aircraft in the world, within the feederliner category, to achieve this distinction.

Design work on the Prince, which is entirely a private venture, began in March, 1947, and the prototype flew just over a year later—on May 13th, 1948. Almost simultaneously with prototype construction, a number of production aircraft were laid down. Some of these have since been completed, and two have been used for a series of particularly searching overseas proving flights. Princes were sent to Africa and India to operate under conditions of varying height, heat and humidity, and a great deal of useful data were thus accumulated.

Primarily, the Prince was conceived as a feederliner offering an exceptional degree of "built-in" comfort and visibility to the 8-10 passengers accommodated. The versatility so often characteristic of a good aircraft is indicated, however, by Royal Navy orders for two versions of the Prince—for communications and crew training—and by successful development of the P.54 survey version. The first P.54, incidentally, is expected to begin service shortly in Southern Persia. Other duties envisaged for the Prince are freighting, pest control, executive travel and air ambulance work.



In its latest form, the Prince has an improved cockpit outline, with vee-windscreen.

Reliability of the Prince's power units, as well as its airframe, has been a keynote of testing and trials to date. The Prince is powered by two 520-550 h.p. Alvis Leonides radials, which will go into service with the unusually high initial overhaul period of 400 hr.

THE GAS TURBINE IN INDUSTRY

A REPORT on its 1949 activities, recently issued by the English Electric Co., Ltd., reveals that several projects for gas turbines for electrical power generation, using various types of fuel, are in hand. Work carried out to date includes full-scale tests on what is, so far, the largest gas-turbine heat-exchanger built in Great Britain. Satisfactory preliminary runs have also been completed on what is believed to be the largest axial-flow gas-turbine compressor produced in this country up to the present time.

Although confident as to the ultimate future of the industrial gas-turbine, the Company expresses itself as anxious to avoid creating an atmosphere of over-optimism, or of offering unrealistic pictures of the possibilities in this field in the immediate future. It is felt that the results achieved on test rigs are not the whole story, and that real judgment on design and performance should be withheld until the machines are run under actual everyday working conditions.

The report also records developments on the aviation side of the Company's business, notably the production of the Canberra, but this is an aspect with which readers of *Flight* are familiar.

TILTMAN LANGLEY LABORATORIES

AT the recent annual general meeting of Tiltman Langley Laboratories, Ltd., held at the Royal Aeronautical Society, the chairman, Mr. A. Hessell Tiltman, reviewed the progress of the company in its second year of operation since taking over from the original partnership of Tiltman and Langley.

The turnover had increased by some 300 per cent in comparison with the previous year. A fair proportion of the work had been in the form of research and development contracts from the Ministry of Supply, but it was the policy to extend the activities to cover the application of modern scientific developments to industry in general.

The technical staff was being constantly strengthened, said the chairman, and important additions were shortly to be made on the metallurgical side.

Mr. Tiltman retired from the chairmanship by rotation and Mr. C. H. Roberts was appointed chairman for the coming year. Mr. Marcus Langley (managing director) and Mr. G. D. Duguid continue to serve on the Board, and it was decided to appoint Mr. J. J. Gerritsen, B.Sc. (chief engineer) and W/C. L. D. Neeves (secretary) to the Board.

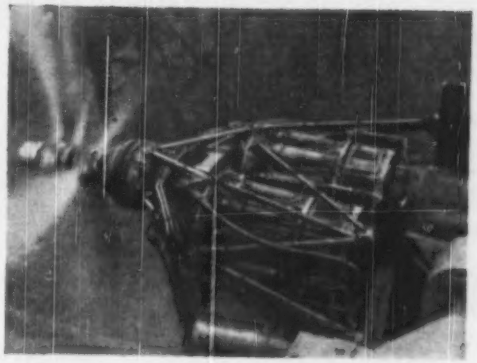
PRE-FLIGHT TRIALS

Extended Full-scale Testing of Proteus Turboprops

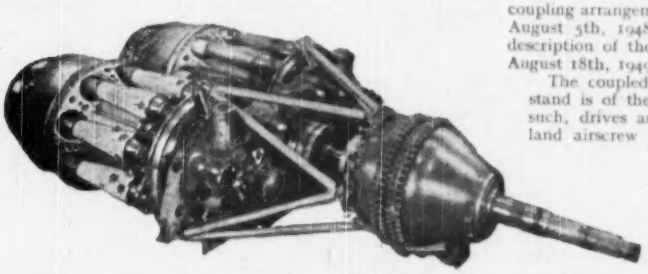
AS aircraft have grown in size, so have the measures taken for intensive and exhaustive testing grown in extent and complexity.

The Brabazon furnishes a good example. So far as the airframe alone was concerned, a full theoretical analysis of the vibration modes was naturally made, but owing to the size of the aircraft and the economic absurdity of so doing, the more usual practice of building the aircraft first and then submitting it to a full-scale vibration test could not be followed. Instead, a vibration model was constructed whereby the elastic and inertial characteristics could be studied, the aircraft being idealized for this purpose as an elastic body with 42 degrees of freedom.

Patently, the quality of the engines is of equal importance to the quality of the airframe, and the Bristol Aeroplane Co., Ltd., is subjecting the 7,000-e.h.p. coupled Proteus turboprop units (with which the Brabazon II and the Saro Princess-class boats will be powered) to a rigorous programme of full-scale test running. Details of the coupling arrangement and reduction gear were given in the August 5th, 1948, issue of *Flight*, and a comprehensive description of the Proteus itself appeared in the issue of August 18th, 1949.



Here seen on the test stand, a coupled Proteus unit for the Saro Princess is now undergoing running trials.



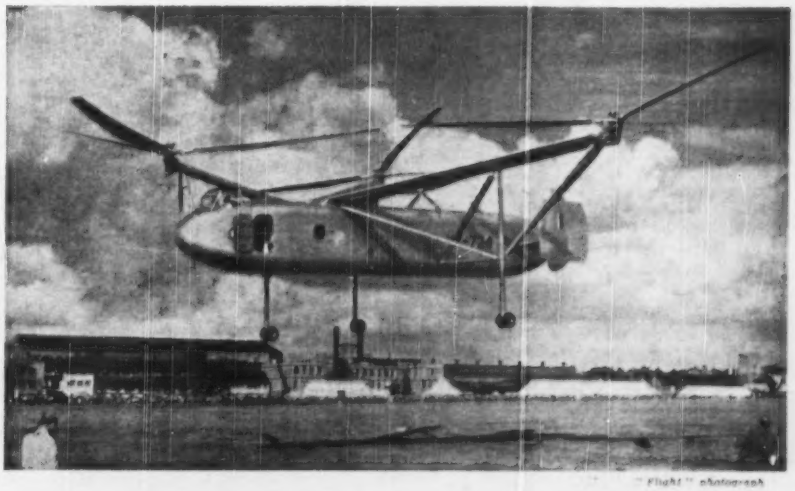
The coupled Proteus provides a compact source for the delivery of 7,000 e.h.p.

The coupled Proteus power unit shown on the test stand is of the type intended for the Princess and, as such, drives an eight-bladed contra-rotating de Havilland airscrew of 16ft 6in diameter. Similar methods were used for developing the double Centaurus engine units installed in the Brabazon I which, as the world knows, is now undergoing flight trials. Over 1,000 hours' running on a test stand similar to that used for the Proteus tests were completed before the Centaurus engines took the prototype Brabazon into the air.

GIVING THE AIR HORSE ITS HEAD

Autorotation Test Successful : Slow Rate of Descent

JUST before Christmas, the Cierva Air Horse, in the hands of Alan Marsh, successfully completed a number of autorotation tests. The aircraft was in its normal flying trim with a crew of four and a ballast load of approximately 1,250lb. Autorotation was initiated at heights varying between 500 and 1,000ft, and not only was the change-over between the power-on/power-off/power-on flight conditions completely satisfactory but, in addition, the control in the autorotative state was reported to be good. Rate of descent in autorotation was recorded as 21ft/sec. at the low forward speed of 35 knots.



"Flight" photograph

DESIGN of TURBOPROP TRANSPORTS

Mr. A. E. Russell's Lecture to the I.Ae.S. in Washington

PART II: Gust Alleviation, Weight Analysis, Conclusion

IN his Wright Brothers Lecture, given before the I.Ae.S. in Washington, Mr. A. E. Russell, B.Sc., A.F.R.Ae.S., chief designer of the Bristol Aeroplane Company's aircraft division, first discussed the essentials of airframe design dictated by the use of turboprops. A digest of this part of the lecture appeared in *Flight* last week. In the second part, summarized here, Mr. Russell went on to discuss gust alleviation, weight analysis, undercarriage design and other aspects of the subject.

The detection of gusts at long range by radar, he said, depended on cloud formation: but experience had shown that severe disturbances could occur in clear air. They had, therefore, to assume that aircraft could not avoid gusts. In certain circumstances, it might be desirable to find means whereby the applied loads on the wings in gusts could be reduced, and there were two methods of achieving this. One was by so arranging the response of the aircraft that alleviation took place automatically; the other was by detecting and measuring some quantity associated with the gust (e.g., gust velocity) and using it to operate a servo mechanism which supplied the alleviation.

An example of the first type of alleviation was to cause the wing to twist nose-down, as the load due to an up-gust built up, thus reducing incidence at the tip. This entailed either a forward distribution of the flexural and inertia axes, or a skew hinge at the root. The flutter and structural problems of these solutions for straight wings led one, suggested the lecturer, to seek more feasible alternatives.

For the second type of alleviation, a symmetrical up-gust—which was usually the most severe case—might be alleviated by nose-down pitching of the whole aircraft. Analysis, however, had shown that the angular accelerations were greater than normal elevator power could provide. While this approach might be made to work and produce some favourable effect on the structure, it would, no doubt, be balanced by equal but opposite reactions of the passengers.

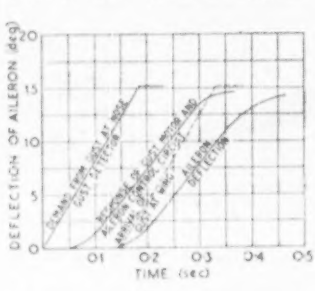


Fig. 5. Curves showing distribution of lags in gust alleviation for the Brabazon I with power-operated flying controls.

The lecturer suggested that by far the most attractive solution made use of symmetric motion of the ailerons, either by direct mechanical coupling or by a servo mechanism. This system, while potentially capable of reducing the bending moment at the wing root by 30 per cent, and of almost completely eliminating the bending on the outer wing, did not involve unacceptably large pitching or vertical motion of the aircraft. A device ahead of the wing which measured directly a change of incidence due to a gust was, in the lecturer's opinion, probably the most promising method of gust detection, operation of the ailerons being by some power or servo system. The essential need was to keep the time lag for the set of operations within the small margins permissible, so that the alleviation was synchronized with the arrival of the gust. In a large aircraft, by virtue of a long body extending forward of the wings, some advance warning was possible. The efficiency of alleviation fell off rapidly with increasing lags. In Fig. 5 was shown the distribution of lags in the response to the British variety of gust for the Brabazon I, the total lag being just acceptable.

On the subject of flutter, Mr. Russell thought that it was by no means confined to large aircraft, although at one time it was considered that flutter of such aircraft would involve considerably more detailed analysis than that for smaller types. It now appeared, however, that it was not so much the size of the aircraft which mattered, but the type of structure employed and, in fact, any new aircraft designed to modern strength theories would require a complete flutter analysis.

The next subject dealt with by Mr. Russell was weight analysis. In order (he stated) to determine the layout of a wing that would satisfy airworthiness requirements and permit the highest possible efficiency in operation, it was necessary to select a wing loading and aspect ratio involving a balance between the weight of the structure to satisfy the demands of strength and stiffness, and the weight of the fuel appropriate to the particular performance characteristics. For this purpose, some rule had to be established whereby the effect of these variables on structure weight could be assessed. The influence of size had to be included.

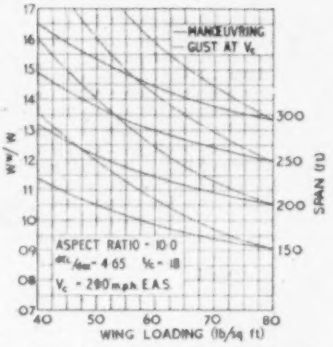


Fig. 6. Curves of wing weight/gross weight ratio for gust and manœuvring cases, showing variation with span and wing loading.

Methods of weight analysis fell into four separate categories successively approaching an increased order of accuracy: (i) a general survey for the purpose of suggesting probable trends and comparing the relative merits of different forms of layout and types of power plant; (ii) a particular design study of an aircraft whose form and type of power plant had already been decided as a result of a general survey; (iii) in the detail design stage when weight estimates could be made from production drawings; (iv) in the manufactured state, when actual weighings could be made of details, components and the complete aircraft.

With a basis for estimating the weight of the structure for different sizes of wings, subjected to specified applied loads, and taking into account the dynamic effects, it was possible to draw a general picture from which the weight of a particular wing could be assessed. As an example, the wing structure weights shown in Fig. 6 had been produced. Of the two sets of curves shown, one was for an ultimate strength factor of 3.75, and the other for the appropriate gust factor at a true speed of 375 m.p.h. at 16,000ft with a representative overswing factor of 1.2 and a factor of safety of 1.5. The difference between these two sets of curves indicated the effective saving made possible by efficient gust alleviation.

TABLE II

Wing loading	Aspect ratio	Fuel for 5,000 miles range	Wing structure weight	Fuel + wing weight
45	10	0.333 W	a: 0.132 W	0.465 W
55	10	0.348	a: 0.123	0.471
65	10	0.362	a: 0.117	0.479
75	10	0.376	a: 0.112	0.488
45	10	0.333	b: 0.160	0.493
55	10	0.348	b: 0.140	0.488
65	10	0.362	b: 0.125	0.487
75	10	0.376	b: 0.115	0.491
55	9	0.388	a: 0.111	0.499
55	10	0.348	a: 0.123	0.471
55	12	0.309	a: 0.135	0.444

a = with gust alleviation. b = without gust alleviation.

From Fig. 6 and other data, it was possible to formulate an opinion of the influence of wing loading and aspect ratio on operating economy, the results being listed in Table II. From this, the following conclusions could be drawn:—

(1) With no gust alleviation and with an aspect ratio of 10,

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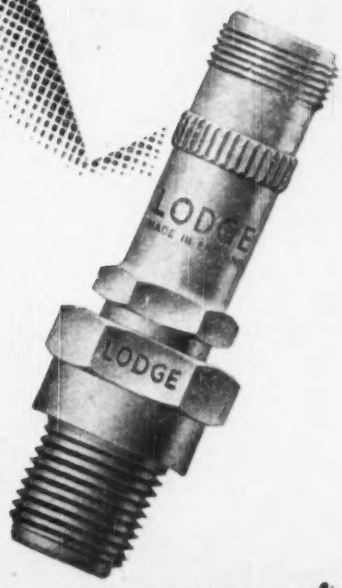
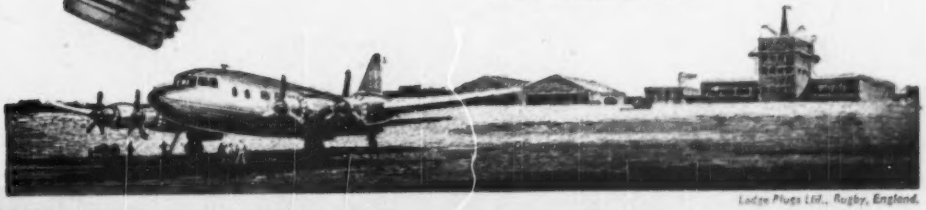
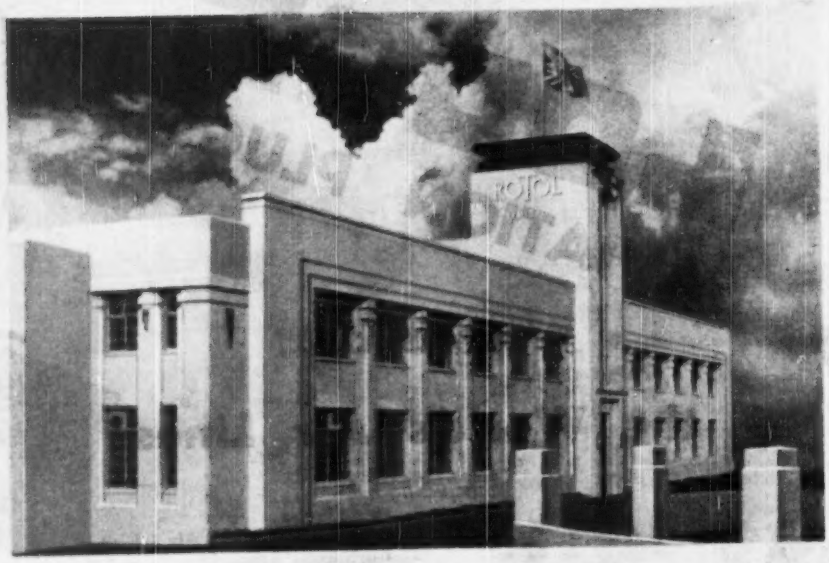




Lodge Plugs Ltd., Rugby, England.

ROTOL



To all our friends
Best Wishes
for
1950

DESIGN of TURBOPROP TRANSPORTS . . .

the combined weight of fuel and wing structure weight was sensibly constant over a wide range of wing loadings and hence, there was no optimum value to give maximum payload. This obviously encouraged the adoption of as high a wing loading as possible, so as to produce the smallest possible size and the highest possible cruising speed. An upper limit might be set by any of the following reasons:—

(a) A minimum acceptable altitude after an engine had failed, so as to be able to fly above rough weather. This was only likely to be critical in the tropics.

(b) The need to be able to take-off from short runways at airports in the tropics and at considerable altitudes.

(c) A volume limitation to contain the fuel. With jet pipes passing through the wing, landing-gear stowage space, heated air passages in the leading edge for anti-icing, and with the rear portion occupied by flaps and their operating mechanisms, the wing area could, in the case of long-range aircraft, be influenced by the fuel capacity.

(2) When gust alleviation was incorporated, a greater payload could be carried if a moderate wing loading was selected. The difference between 55 lb/sq ft and 75 lb/sq ft wing loading was equivalent to a difference of payload equal very nearly to 2 per cent of the gross weight.

(3) The aspect ratio should be as high as possible. Of the aerodynamic variables, this characteristic showed the highest profit. With a high aspect ratio, the aero-elastic criteria were more easily met if the wing loading was also high. Even at moderate wing loadings, there seemed to be no reason, in the lecturer's opinion, why values in excess of 12 or even 15 should not be adopted.

Mr. Russell stated that it had frequently been asserted that, for large landplanes, the cost and constructional problems in providing runways of adequate length and strength would become prohibitive. This, he thought, need not in fact be the case, since it could be shown that multi-wheel landing gear would compensate the effect of the increased weight upon the runway by suitably spreading the load.

From theory and experiments in soil mechanics, it had been shown that the capacity of runway structure to sustain a load W depended on the contact pressure p, and that $W^a \cdot p^b$ was a constant. Experimental values for the indices, based upon tests on both "rigid" and "flexible" pavements had provided the relationship of $W^{0.56} \cdot p^{0.44} = a$ constant.

As a pair of wheels and tyres were moved apart, the carrying capacity of the runway, as limited by the critical deflection, increased, since by the method of superposition the deflection beneath one wheel due to both could be shown to diminish. Average dual wheels as now in use were spaced about two tyre-widths apart, and permitted an increase of about 50 per cent over the load carried on a single wheel with the same tyre pressure.

If large aircraft were equipped with load-spreading landing gear, it could be expected that runways greater than I.C.A.O. Class 3 strength need not be provided for aircraft up to 300,000 lb to 400,000 lb gross weight. That this trend in development did not require an increase in the proportion of weight was supported by the evidence of an analysis of the percentage of gross weight devoted to landing gear for a variety of aircraft. It could be demonstrated that no increase in percentage weight need be expected with growth in size.

In giving the conclusions of this most valuable paper, Mr. Russell stated that the results of his analysis of transport aircraft designed specifically for long-range operation showed that the wings were the only components of the structure where the proportion of weight inevitably increased with increase of gross weight. The actual amount of increase would depend on the values of wing loading and aspect ratio selected. If these values were maintained constant, the order of increase was approximately 1½ per cent of the gross weight for each increase of 100,000 lb in gross weight. The minimum basic value for reference should be that appropriate to an aircraft of 100,000 lb gross weight.

This meant that for an aircraft of, say, 300,000 lb gross weight, it was possible to design the wings having a weight of 12 per cent and the total structure, including the fuselage, tail unit, landing gear, flying-control system, engine mountings and cowlings, having a weight equal to 28 per cent of the gross weight. It was not surprising to find that, in practice, the ratio of the weight of a fully equipped and furnished structure decreased slowly with increase in gross weight.

Mr. Russell referred to the authoritative assessment made by Mr. Peter Masefield in the Fourth British Commonwealth and Empire Lecture, and stated that, although for long stage distances, the economic factor was favourable to large aircraft, nevertheless, the customer was always right, for the psychology of the travelling public did much to determine the passenger load-factor when a choice was available. With increasing size of body, more scope was possible in the layout of seating, lounges and toilet arrangements, including possibly two or more standards of comfort. One had a simple faith that passengers would prefer to have a little more space provided for their accommodation and, whilst all would appreciate the lower noise and vibration levels of turbine engines, the few with an aeronautical upbringing would, in time, cease to speculate on the hazards of explosive decompression.

Summing up the overall picture, Mr. Russell concluded that, when long-range was a necessary or desirable requirement for civil air transport, the rôle could only be filled by large aircraft. The point had not yet been reached where the maximum operating efficiency was adversely affected by fundamental technical barriers.

FAIREY'S LONG-SERVICE CELEBRATION

ALL the members of the Fairey Aviation Co., Ltd., who had completed more than 25 years' service with the firm, were entertained at the Connaught Rooms, London, on December 22nd by the chairman, Sir Richard Fairey. In the words of a visitor, "There must be something about working for this concern"—for no fewer than 282 members were present and each received a testimonial *and a gold watch*. Those with over 30 years' to their credit were given half-hunters and the remainder wrist-watches. This total of 282 employees with over a quarter of a century's service represents slightly more than 20 per cent of Fairey's personnel in 1924.

Mr. Beckett, who has 32 years' service to his credit, receives his watch and testimonial from Sir Richard Fairey. At the table are Lord Brabazon (left) and Mr. W. Broadbent.

At the close of the presentation ceremony, Sir Richard himself was asked to accept a silver salver on which were inscribed the facsimile signatures of the 282 guests, and a gold watch from the other directors of the company.

The toast to "The Old Firm" was proposed by Mr. B. G. Slater, who joined Fairey's in 1915, and who took the first Short seaplane made by them (the company started in 1915 with an order for 12 Short 225s) to Calshot for trials. Sir Richard, replying, was visibly moved by the occasion and reminisced for a while on the old days when he was chief engineer at Short's from 1913 to 1915. He recalled his interview at the Admiralty with Admiral Murray Sueter at the time when he, Sir Richard, wanted to start his own concern, and the joy with which he took away from the interview his first order for Short seaplanes. In the course of a brief history of the company he pointed out that, in addition to crippling the Italian navy in Taranto harbour, the famous Swordfish had sunk over a million tons of enemy shipping. Sir Richard also had a special word for the test pilots who had lost their lives in the firm's service.

Marshal of the Royal Air Force Lord Trenchard, Lord Brabazon of Tara and Rear Admiral The Mackintosh of Macintosh were present as guests of honour, and a tribute was paid to them in a speech by Mr. Broadbent.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"Reheat"

PATIENTLY I have waited for the pundits to pronounce on "afterburning" or "reheat." Like your correspondent Mr. J. Talbot (*Flight*, December 8th), I had noted the ambiguity of "reheat" and consider "afterburning" to be preferable. As a point of historical interest it may be mentioned that Dugald Clerk, about 60 years ago, applied the term "afterburning" to his hypothesis that in the combustion of gas not all the heat was liberated by the time maximum pressure was reached, but that burning continued long after that point. If memory serves me aright, this was never substantiated. It has no currency to-day and therefore does not affect the issue.

The American preference for "afterburning" is interesting, but their choice of words is not always so sound. For a turbojet unit with "afterburning" they have coined the word "turboramjet." In my opinion this is basically a contradiction. A ramjet is specifically a thermal duct which, by reason of its forward speed, effects compression of the air for combustion. It can, therefore, dispense with the mechanical compressor and, of course, the turbine which is required solely to drive it. To infer that a tailpipe afterburner is a ramjet because it receives the high-velocity turbine efflux is surely false. The working medium of a ramjet is atmospheric air; in an afterburner the air is contaminated by nitrogen, carbon dioxide and water vapour. No useful energy can be obtained from a ramjet while stationary on the ground or moving at low forward velocity; an afterburner, however, can materially augment the thrust of a turbojet when static or during take-off.

Coventry. F. SINCLAIR.

Safety Fuel?

I SHALL be glad if one of your technically minded readers can tell me whether the following idea could have any scientific basis for development as a safety measure.

With the introduction of gas turbines and the simplification of aircraft engines, is it possible to mix some substance with the paraffin so that it is non-inflammable in bulk when stored in the aircraft tanks? And would it then be possible to include a device (mechanical or chemical) to separate the substance from the paraffin just before it is burned?

Chesham Bois, Bucks. N. H. MAPPERLEY.

Jets—U.S. and British

I FEEL I must comment on your leader, "Jet Awakening," in *Flight* of November 24th. To quote you: "Yet of all large post-war civil projects in this country, the Comet owes most to private enterprise and capital—though not, perhaps, to the extent of $25,000,000 to $30,000,000, the figure quoted by Capt. Eddie Rickenbacker for the development of a comparable aircraft."

Surely, the recent announcement in the public Press by the Minister of Supply to the effect that the Comet has so far cost the country £4,000,000 (at pre-devalued £1 exchange rate 10,000,000 dollars) is not exactly private enterprise, or far out in equivalent U.S. costs quoted by Capt. Rickenbacker.

Then again, do we really know what the American engine makers are doing? How is it the Shooting Star engines are running authorized overhaul lives in excess of our Meteor engines, to say nothing of the fact that one of their standard fully equipped fighters holds the world's air speed record?

Credit where credit is due, please, Mr. Editor, without too much complacency. Time will tell whether we shall sell our jet airliners abroad in any quantity; and please pep up our aircraft makers for the proposed New Zealand Air Race in 1951, because they had better not "lay on their oars" too much, for time and American aircraft fly very fast.

Paisley. P. W. LAMBELL, A.R.Ae.S.

[The statement by the Minister was obscure. The £4,000,000 referred to breaks down as follows:—Development of the Ghost military turbojet for the Venom and for export (Saab J-29), £2,000,000 (every sizeable civil transport to-day is powered by engines developed in the first place for military purposes, and this sum cannot fairly be charged against the Comet. Of the £2,000,000 remaining, about half the cost of three D.H.108 research aircraft can be charged against the Comet and the other half against military aircraft to come. In addition, the whole cost of two Comets bought *at ordinary commercial price*, plus a very small advance in connection with testing, is represented in the sum. The M.o.S. requirement for two high-speed, four-jet research aircraft has no direct connection with Comet development. Any direct contribution towards the Comet airliner, other than encouragement and advice, is thus fairly insignificant.

The J-33 overhaul period is 300 hr, while that of the Derwent 5 is at present 200 hr and may very shortly be 250 hr. The J-33 is a direct development of early Power Jets designs and has been operated on a large scale for a number of years (Over 1,400 Shooting Stars have been built). The overhaul period of the Goblins in service is 600 hr. The amount of day-to-day squadron maintenance between overhauls is ignored in this argument.—ED.]

Wheels-up Landings

A PILOT attempting a crash-landing will often choose to leave his undercarriage retracted, this being the only way, at present, of landing an aircraft on rough ground. A flying-boat forced down on to rough ground fares better as a rule, due to the design and strength of the hull, which is admirably suited to "glider" landings.

Why not, therefore, make crash-landings provision on landplanes, using reinforced fuselage bottoms, or, better still, arranging for a retracting skid or emergency landing wheel? One landing-wheel or skid, centrally placed, would be better than nothing in the advent of undercarriage failure.

Lateral control can be maintained at speeds considerably less than flying speed; thus, with a central balancing-point of some kind, an aircraft could lose a great deal of its speed before a wing-tip hit the ground.

Also, consideration should be given to the possibility of locking an undercarriage at, or about, the half-retracted position, which would keep the aircraft's fuselage clear of the ground whilst minimizing the tendency to dig in which occurs with a fully extended undercarriage on contacting rough ground.

Furthermore, is it really necessary for an aircraft to fly around for hours simply to use up petrol before attempting a crash landing? A jettison valve can be fitted, which could be further arranged to ensure a small reserve of fuel with which to make the final run-in.

Congratulations to you on the production of a fine journal.

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FORTHCOMING EVENTS

Jan.	7.	British Interplanetary Society: "The Circum-lunar Rocket," by K. W. Gatland and A. E. Dixon.
Jan.	11.	R.Ae.S. (Weybridge): Brains Trust.
Jan.	11.	Royal United Service Institution: "Higher Defence Organization," by Lt.-Gen. Sir Leslie C. Hollis, K.B.E., C.B., R.M.
Jan.	14.	British Interplanetary Society (Manchester): "Space Stations," by E. Burgess.
Jan.	18.	Royal United Service Institution: "Airfields in a War of Movement," by A. Cdre. T. G. Pike, C.B., C.B.E., D.F.C.
Jan.	19.	R.Ae.S. Section Lectures: "Acoustical Aspects of Recent Aerodynamic Research" (joint symposium with Acoustics Group of the Physical Society).
Jan.	20.	Institute of Physics (Manchester): "Temperature Measurement," by J. A. Hall.
Jan.	20.	London Aeroplane Club: Annual Dinner Dance.
Jan.	24.	R.Ae.C.: "Air Travel through the U.S.A." film by William Courtenay, M.M. (At Londonderry House.)
Jan.	31.	R.Ae.S. Section Lecture: "Further Problems of Aircraft Stressing," by J. H. Argyris, A.F.R.Ae.S.
Feb.	1.	Royal United Service Institution: "Aircraft for Army Uses," by Lt.-Gen. R. N. Gale, C.B., D.S.O., O.B.E., M.C.
Feb.	4.	British Interplanetary Society: Discussion—"Effects of Interplanetary Flight."
Feb.	8.	R. Ae. S. (Brough): "Rocket Propulsion and Inter-Planetary Flight," by A. V. Cleaver, A. R. Ae. S.
Feb.	9.	R.Ae.S.: "Producing a Prototype Aircraft," by C. T. Wilkins, A.F.R.Ae.S.
Feb.	13.	Institute of Transport: Brancker Memorial Lecture—A.V.-M. D. C. T. Bennett, C.B., C.B.E., D.S.O.
Feb.	14.	R.Ae.S. Section Lecture: "Prototype Testing," by D. R. H. Dickinson, A.F.R.Ae.S.
Feb.	17.	Institute of Navigation: "Air Traffic Control," a symposium of papers.
Feb.	21.	R.Ae.S. (Belfast): "Strength-testing of Aircraft," by Dr. P. B. Walker, M.A., Ph.D., F.R.Ae.S.
Feb.	21.	R.Ae.S. Section Lecture: "Air-Intake Design for High-speed Aircraft," by Dr. J. Seddon, B.Sc.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

A Unique Honour

AS announced briefly in these columns on December 22nd, R.A.F. Station Bridgnorth is to receive the freedom of the borough of Bridgnorth, Salop. This honour—which is without precedent in the annals of the R.A.F.—is also shared by Technical Training Command, to which the Station belongs.

Cockpit Uniformity

FUTURE aircraft for the R.A.F.—those now in the development stage—are to have cockpit control knobs of standard shape, according to the function they perform. The main result of this policy of standardization will be to provide pilots with instant identification of controls, by feel alone if necessary.

Flap control knobs, for example, will be uniform-sized spheres with small cylindrical projections on each side, a three-quarter-inch cube will characterize supercharger controls, and mixture control levers will have a disc with three small pyramids on the rim. Emergency controls, such as those for ejector seats or fire extinguishers, will be made more conspicuous by diagonal black and yellow stripes.

Details of standardization were settled after a series of tests conducted by the R.A.F. Institute of Aviation Medicine. Similar observations were made some time ago in America—by the psychological branch of the Aero Medical Laboratory at Wright Field—and described in *Flight* of August 14th, 1947. The article illustrated eight basic shapes, picked from a selection of 22 different knobs, among which there was no confusion when identified by touch alone.

FOR NIGHT WORK: First air-to-air picture of the de Havilland 113, two-seat night fighter version of the Vampire. It will be seen that fin area has been increased, to compensate for the longer nose, which houses radar equipment.

R.A.F. Appointments

THE Air Ministry announces that A.V-M. C. W. Weedon, C.B., C.B.E., has been appointed Director-General of Engineering at the Air Ministry. A.V-M. Weedon, who is 48, was commissioned from Cranwell in 1920.

He has been Senior Air Staff Officer at H.Q. Technical Training Command since October 1948, and was formerly A.O.C., No. 41 Group, Maintenance Command, going there in July, 1946, on his return from the Far East, where he was Chief Maintenance Officer at H.Q. Air Command, South-East Asia, from March, 1944. Before going to the Far East he was at the Ministry of Aircraft Production for three and a half years.

A.V-M. R. D. Jones, C.B., A.F.C., has been appointed to Technical Training Command as A.O.C., No. 24 Group.

Since October, 1948, he has been S.A.S.O. at H.Q., Reserve Command, and is now returning to the Group which he formerly commanded from March, 1947. Previously he was head of the planning staff which was set up at the Air Ministry early in 1946, to plan the present technical services organization of the R.A.F. He was with the British Air Commission in Washington from 1941 to 1943, and was afterwards Deputy Controller of Research and Development at the Ministry of Aircraft Production for nearly three years.

A.V-M. Jones is succeeded at Reserve Command by A. Cdre. (act. A.V-M.) G. S. Hodson, C.B., C.B.E., A.F.C., who has commanded No. 205 Group, in the Middle East, since January, 1947. He was formerly Air Officer in Charge of Administration at H.Q., Coastal Command, going there early in 1946 after having been a base commander in Bomber Command and formerly Air Officer in Charge of Training at Bomber Command H.Q. A.V-M. Hodson, who is 50, entered the R.F.C. in 1917.

A second new appointment to Technical Training Command is that of A.V-M. L. G. Harvey, C.B., who becomes Senior Air Staff Officer. A.V-M. Harvey has commanded No. 24 Group since January, 1948, and formerly commanded No. 47 Group, Transport Command, from October, 1946, after having been Chief Maintenance Officer, and later

HANDING OVER: On the first day of the New Year, Marshal of the R.A.F. Lord Tedder retired from his appointment as Chief of the Air Staff, which he has held for the past three years. He is shown with his successor, Air Chief Marshal Sir John Slessor (left) at a recent ceremony in London.

SERVICE AVIATION . . .

Senior Technical Staff Officer, of Transport Command for two years.

Previously he was chief engineer officer of No. 45 (Atlantic) Group, Transport Command, at Dorval, Canada, and—before going there in February, 1944—commanded No. 8 School of Technical Training. Earlier in the war he was in charge of the Airborne Forces Experimental Establishment. Born in 1897, A.V-M. Harvey entered the R.A.F. in 1918 after service with the Royal Warwickshire Regiment and the R.F.C.

Air Commodore L. Dalton-Morris, C.B.E., has been appointed Chief Signals Officer at Headquarters, Middle East Air Force, Ismalia. He was formerly Commanding Officer of the R.A.F. Central Signals Establishment from January, 1948, after having been Director of Signals at the Air Ministry from August, 1946.

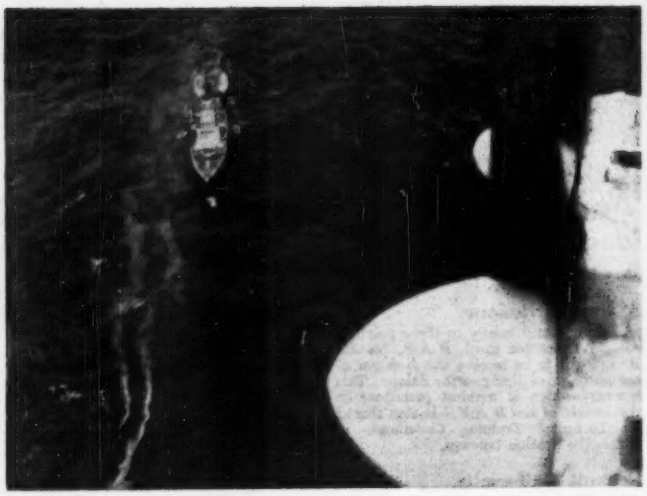
Qualifying as a signals specialist in 1930, A. Cdre. Dalton-Morris made an intensive study of radar before and during the war, and he was personally responsible for some of the radar countermeasures that were put into operation against Germany. During the Battle of Britain he was Deputy Chief Signals Officer of Fighter Command. He later held a similar post with Bomber Command and, in 1943, he went from there to form the first mobile base signals and radar units. He also formed and commanded the Signals Battle Training School at Chigwell, from which were turned out all the mobile signal units used in the invasions of North Africa and Normandy.

Returning to Bomber Command H.Q. as Chief Signals Officer, early in 1944, he headed a small team of signals officers and scientists in the development and application of a number of radio devices which so upset the enemy's defence and control systems as to effect an immediate reduction of Bomber Command's losses. He also helped to plan the great D-Day "spoof" by Bomber Command which led the enemy to expect invasion in the Pas de Calais area.

A. Cdre. Dalton-Morris was born in 1906 and commissioned in the R.A.F. in 1924.

G/C. C. J. Nobbs has been appointed S.A.S.O., No. 41 Group, Maintenance Command, with the acting rank of Air Commodore. Until recently he was Senior Equipment Staff Officer at Headquarters, B.A.F.O., Germany.

Before going to Germany in December, 1947, A. Cdre. Nobbs was on equipment staff duties at Transport Command H.Q. for two years, and was formerly at the Air Ministry, in the Directorate-General of Equipment, from May, 1942, becoming an Assistant Director of Equipment, three months later, and a Deputy Director in 1944. Previously he was on equipment duties in the Middle East from November, 1936. Born in 1902, A. Cdre. Nobbs was commissioned in the R.A.F. in 1926.



COASTAL POSTMEN: Shortly before Christmas, Coastal Command Lancasters from Kinloss dropped mail, food and gifts to the weather ships *Weather Observer* and *Weather Explorer*, which were sighted, respectively, 520 miles west of Scotland, and 200 miles south of Iceland. Viewed from one of the aircraft is the *Weather Observer*, its boats setting out to pick up the welcome supply canisters (indicated by smoke).

Chipmunks for Easter

BAD weather during the winter has curtailed flying training for many members of R.A.F.V.R. university air squadrons. During 1950, therefore, more squadrons than usual will attend camps at Easter, and new cadets will be able to begin their training on D.H. Chipmunks. These new trainers have already been delivered in some numbers from the manufacturers, and R.A.F.V.R. units are now due to receive the first examples.

R.A.F. Police Competition

NO. 137 Flight, No. 5 District of the R.A.F. Police in London, has won the de Putron Trophy, awarded annually to the R.A.F. police flight in the United Kingdom or Europe which gains the highest percentage of marks for efficiency, turnout, drill, maintenance of records and general cleanliness. Joint winners of the 1948 Trophy were Nos. 106 and 110 Flights, B.A.F.O., which achieved second and third place respectively in 1949. The Trophy was awarded by A. Cdre. O. W. de Putron, the R.A.F. Provost Marshal, who recently initiated a second competition (for sports) between R.A.F. police units.

Chaplain's Memorial

AIR MARSHAL SIR BASIL EMBRY has appealed for contributions towards the establishment of a memorial to the late Monsignor H. Beauchamp, who was the R.A.F. Principal Chaplain (R.C.) for over 20 years. The proposed memorial will take the form of a tablet in the Catholic church at Halton, and the endowment of a book-prize to be presented at each passing-out parade of Halton apprentices. Contributions towards the sum required, £500, should be addressed to S/L. V. O. M'Quillin, Hon. Treasurer, c/o Principal Chaplain (R.C.), 33, Draycott Place, Chelsea, London, S.W.3. (Cheques should be made out to "The Monsignor Beauchamp Memorial Fund.")

W.R.A.F. RESERVIST: The first woman pilot of the R.A.F.V.R. in North-eastern England is Mrs. Rhoda Fairbairn, here seen at Usworth airfield in Durham with Mr. G. Knox, assistant C.F.I. of No. 23 Reserve Flying School.

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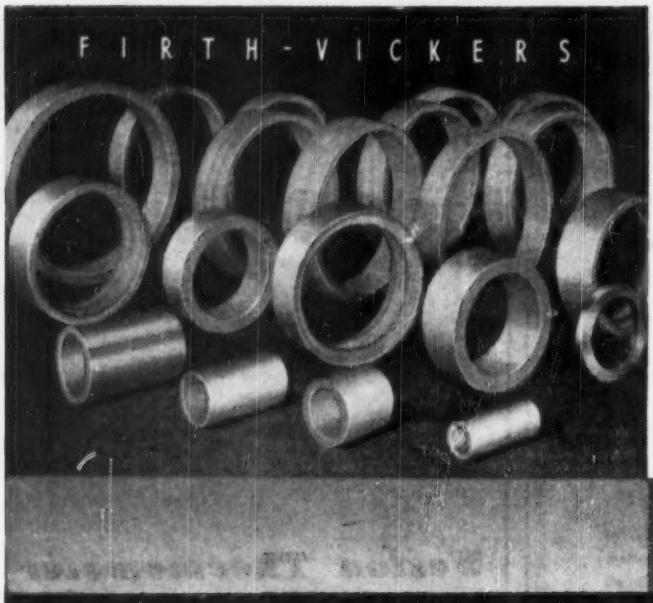

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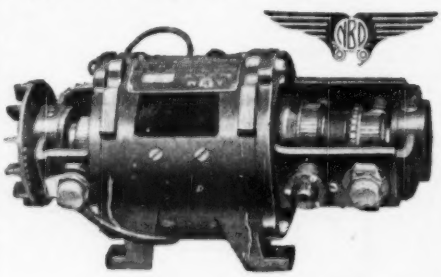

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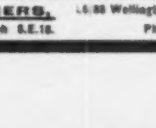

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INSTALLATION Engineers required for Gas Turbine and Piston Engine Installation work.—Write in first instance, giving age, qualifications and full details of previous experience in chronological order to The Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [4455

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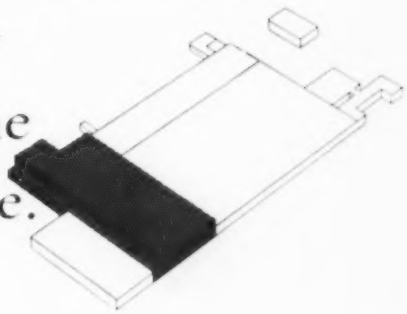

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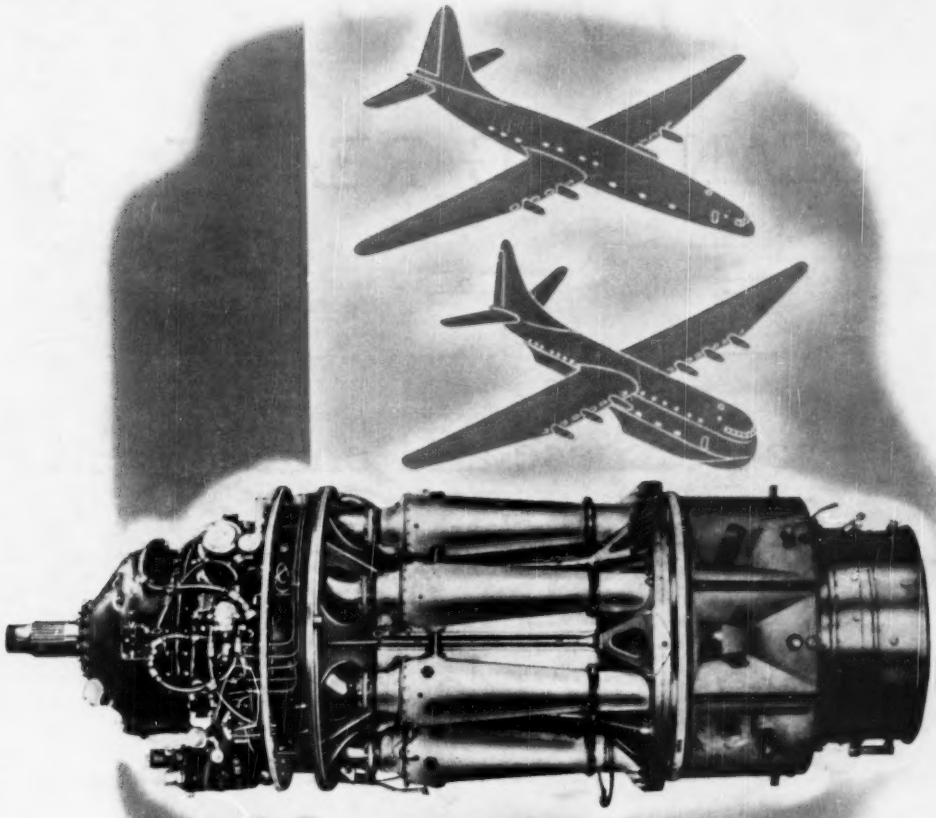

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